QUANTITATIVE APTITUDE

STATS COMPLETE THEORY REVISION

BY : SHIVANI SHARMA

Language	Word
LATIN	STATUS
ITALIAN	STATISTA
GERMAN	STATISTIK
FRENCH	STATISTIQUE

PRIMARY

The data which are collected for the first time by an investigator or agency

SECONDARY

collected data used by a different person or agency.

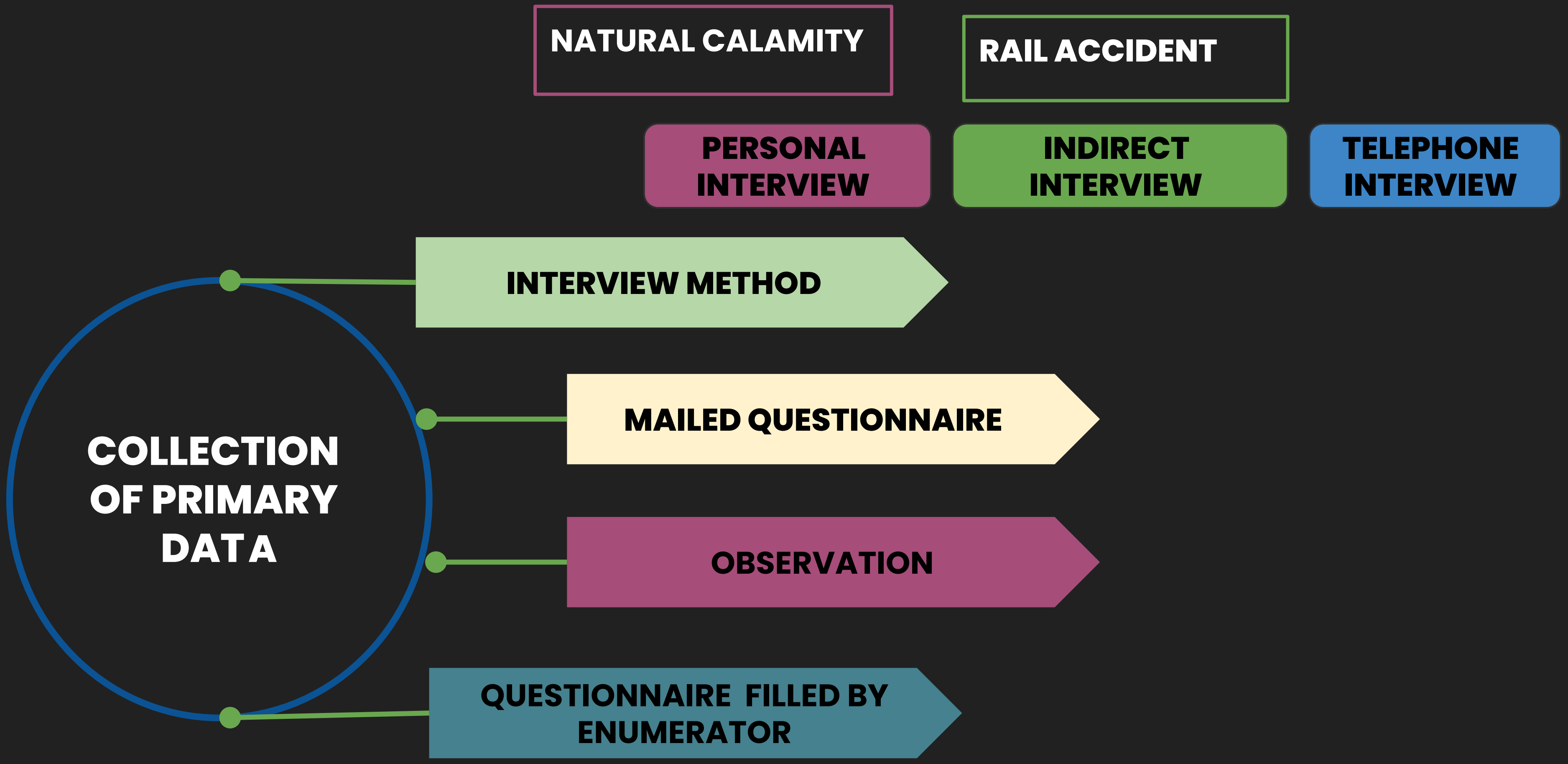
DISCRETE VARIABLE

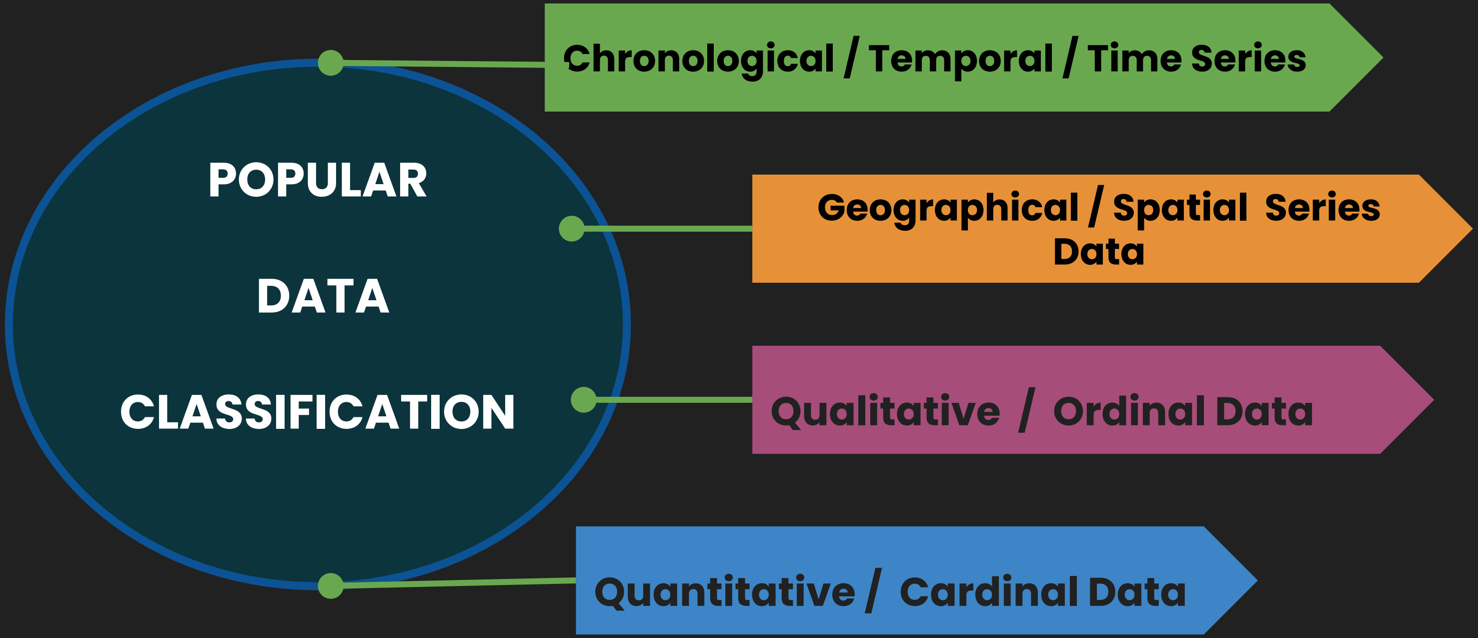
- Number of petals in flower
- Number of misprints a book contains
- Number of road accidents in particular locality
- Annual income of a person
- Marks of a student
- The distribution of shares
- Salary of a person (Personal point of view)

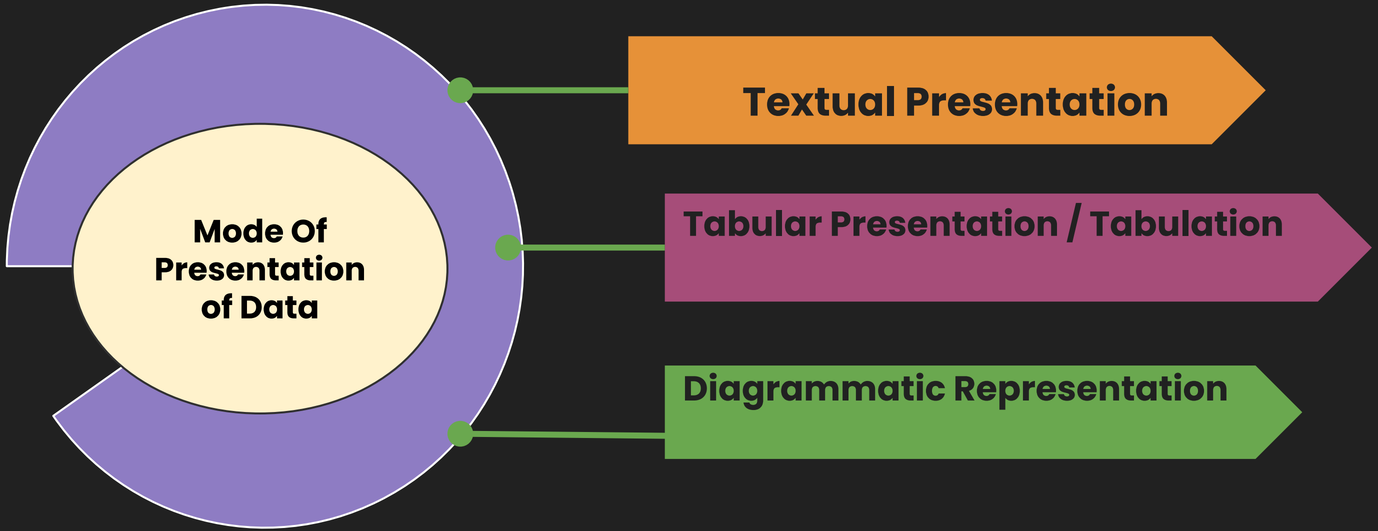
CONTINUOUS VARIABLE

- Height
- Weight
- Sale
- The distribution of profits of a blue-chip company
- Age of a person
- Turnover of a company

(Commercial point of view)


NATURAL CALAMITY
RAIL ACCIDENT
PERSONAL INTERVIEW
INDIRECT INTERVIEW
TELEPHONE INTERVIEW
INTERVIEW METHOD
COLLECTION OF PRIMARY DATA
MAILED QUESTIONNAIRE
OBSERVATION
QUESTIONNAIRE FILLED BY ENUMERATOR


POPULAR
DATA
CLASSIFICATION
Chronological / Temporal / Time Series
Geographical / Spatial Series Data
Qualitative / Ordinal Data
Quantitative / Cardinal Data

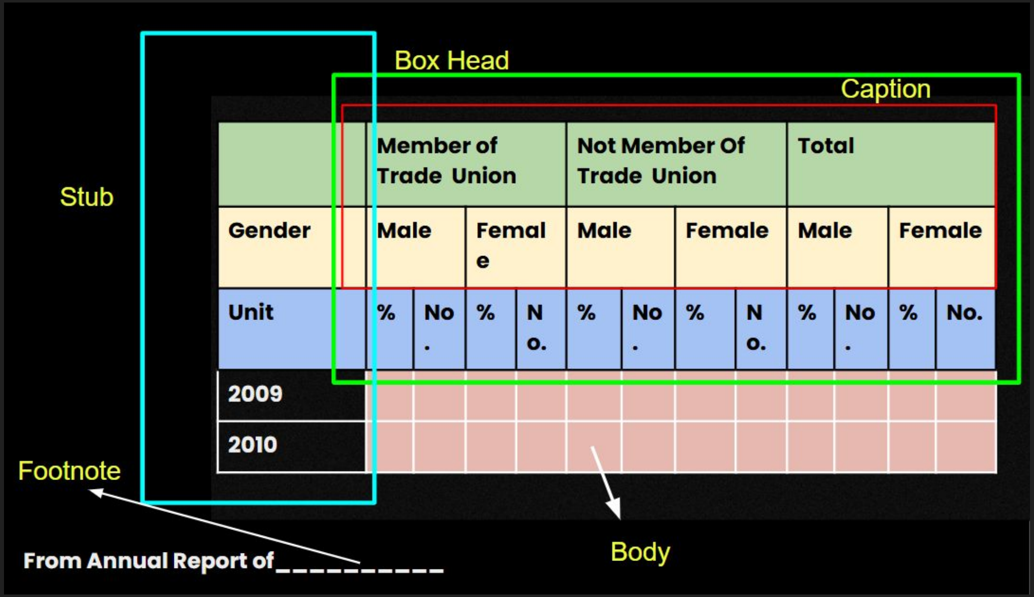

Mode Of Presentation of Data
Textual Presentation
Tabular Presentation / Tabulation
Diagrammatic Representation

A Table has 5 Parts

BOX HEAD *entire upper part of the table which includes columns and sub-column numbers, unit(s) of measurement along with caption.*

STUB *left part of the table providing the description of the rows.*

FOOTNOTE *source of the data at the bottom of table*



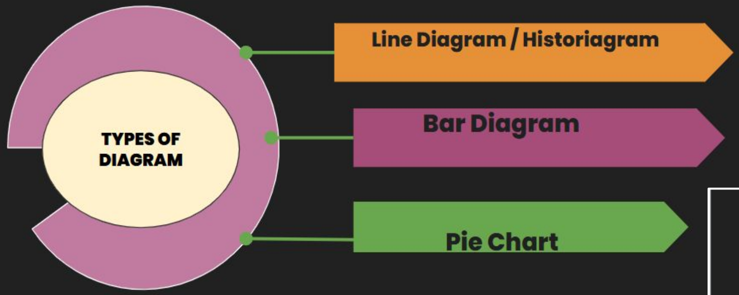
	Member of Trade Union				Not Member Of Trade Union				Total			
Gender	Male		Female		Male		Female		Male		Female	
Unit	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.
2009												
2010												

CAPTION *the upper part of the table, describing the columns and sub-columns,*

BODY *main part of the table that contains the numerical figures.*

Line Diagram

- Generally used for time series .
- For wide fluctuation : LOG CHART OR RATIO CHART
- For two or more series of same unit - MULTIPLE LINE CHART
- For two or more series of distinct unit - MULTIPLE AXIS CHART



$$\text{Segment angle} = \frac{(\text{segment value} \times 360^0)}{(\text{total value})}$$

Class length = UCB - LCB

$$\text{mid-point} = \frac{LCL + UCL}{2}$$
$$= \frac{LCB + UCB}{2}$$

No. of class interval × class lengths = Range

(We always take the next integer as the number of class intervals so as to include both the minimum and maximum values).

Frequency Density

$$\text{Frequency Density} = \frac{\text{Class Frequency}}{\text{Class Length of Class}}$$

Relative Frequency

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

Relative frequencies add up to unity

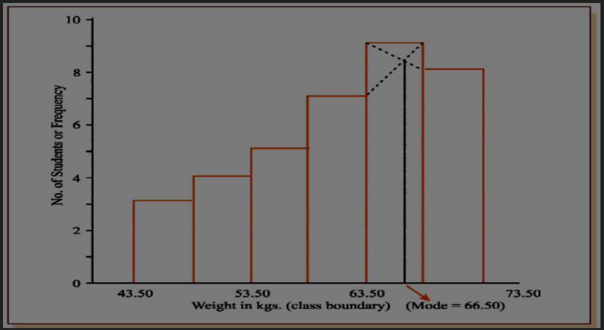
Relative frequency for a particular class

Lies between 0 and 1

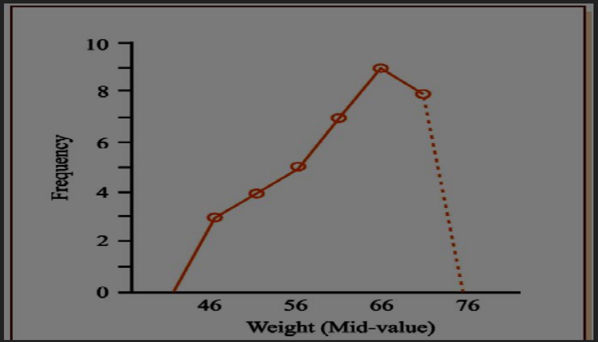
Percentage Frequency

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

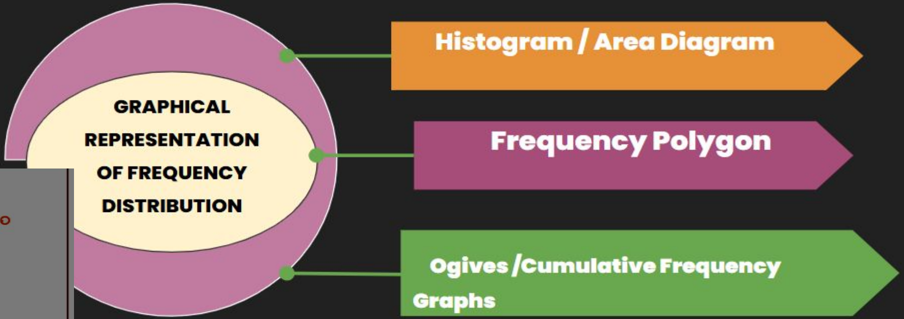
percentage frequencies add up to one hundred.

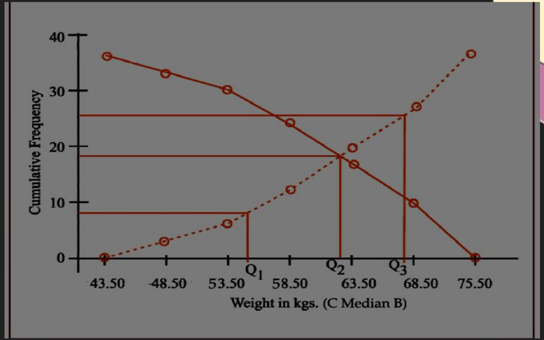


HISTOGRAM : MODE



FREQUENCY POLYGON

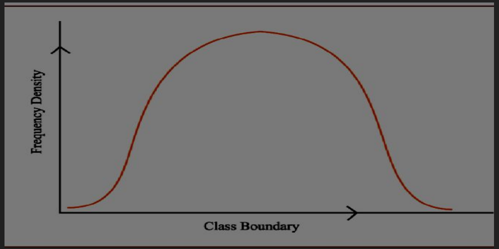




OGIVES / CUMULATIVE FREQUENCY GRAPH : MEDIAN /QUARTILES

FREQUENCY CURVE : limiting form of a histogram or frequency polygon

BELL SHAPED

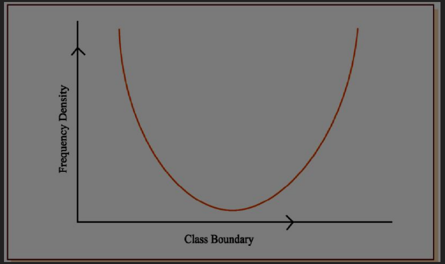


Most of the commonly used

The distribution of height, weight, mark, profit etc.

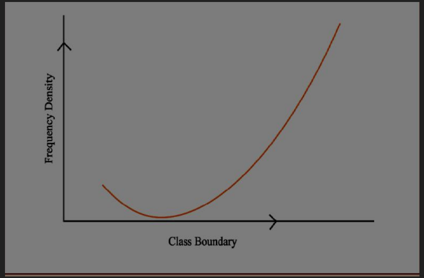
The frequency, starting from a rather low value, gradually reaches the maximum value, somewhere near the central part and then gradually decreases to reach its lowest value at the other extremity.

U – SHAPED



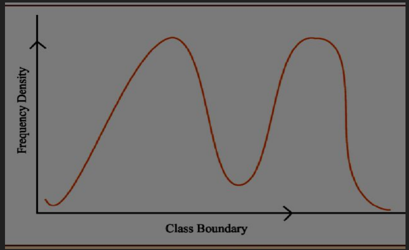
the frequency is minimum near the central part and the frequency slowly but steadily reaches its maximum at the two extremities.

J – SHAPED



The J-shaped curve starts with a minimum frequency and then gradually reaches its maximum frequency at the other extremity.

MIXED



Pg 13.6

Data may be classified as -

(i) Chronological or Temporal or Time Series Data;

(ii) Geographical or Spatial Series Data;

(iii) Qualitative or Ordinal Data;

(iv) Quantitative or Cardinal Data.

When the data are classified in respect of successive time points or intervals, they are known as time series data. The number of students appeared for CA final for the last twenty years, the production of a factory per month from 2000 to 2015 etc. are examples of time series data.

Data arranged region wise are known as geographical data. If we arrange the students appeared for CA final in the year 2015 in accordance with different states, then we come across Geographical Data.

Data classified in respect of an attribute are referred to as qualitative data. Data on nationality, gender, smoking habit of a group of individuals are examples of qualitative data. Lastly, when the data are classified in respect of a variable, say height, weight, profits, salaries etc., they are known as quantitative data.

Data may be further classified as *frequency data* and *non-frequency data*. The qualitative as well as quantitative data belong to the frequency group whereas time series data and geographical data belong to the non-frequency group.

(a) Textual presentation

This method comprises presenting data with the help of a paragraph or a number of paragraphs. The official report of an enquiry commission is usually made by textual presentation. Following is an example of textual presentation.

'In 2009, out of a total of five thousand workers of Roy Enamel Factory, four thousand and two hundred were members of a Trade Union. The number of female workers was twenty per cent of the total workers out of which thirty per cent were members of the Trade Union.

In 2010, the number of workers belonging to the trade union was increased by twenty per cent as compared to 2009 of which four thousand and two hundred were male. The number of workers not belonging to trade union was nine hundred and fifty of which four hundred and fifty were females.'

The merit of this mode of presentation lies in its simplicity and even a layman can present data by this method. The observations with exact magnitude can be presented with the help of textual presentation. Furthermore, this type of presentation can be taken as the first step towards the other methods of presentation.

Textual presentation, however, is not preferred by a statistician simply because, it is dull, monotonous and comparison between different observations is not possible in this method. For manifold classification, this method cannot be recommended.

(iii) Ogives or Cumulative Frequency Graph

By plotting cumulative frequency against the respective class boundary, we get ogives. As such there are two ogives – less than type ogives, obtained by taking less than cumulative frequency on the vertical axis and more than type ogives by plotting more than type cumulative frequency on the vertical axis and thereafter joining the plotted points successively by line segments. Ogives may be considered for obtaining quartiles graphically. If a perpendicular is drawn from the point of intersection of the two ogives on the horizontal axis, then the x-value of this point gives us the value of median, the second or middle quartile. Ogives further can be put into use for making short term projections.

Frequency Curve

A frequency curve is a smooth curve for which the total area is taken to be unity. It is a limiting form of a histogram or frequency polygon. The frequency curve for a distribution can be obtained by drawing a smooth and free hand curve through the mid-points of the upper sides of the rectangles forming the histogram.

There exist four types of frequency curves namely

(a) Bell-shaped curve;

(b) U-shaped curve;

(c) J-shaped curve;

(d) Mixed curve.

Most of the commonly used distributions provide bell-shaped curve, which, as suggested by the name, looks almost like a bell. The distribution of height, weight, mark, profit etc. usually belong to this category. On a bell-shaped curve, the frequency, starting from a rather low value, gradually reaches the maximum value, somewhere near the central part and then gradually decreases to reach its lowest value at the other extremity.

For a U-shaped curve, the frequency is minimum near the central part and the frequency slowly but steadily reaches its maximum at the two extremities. The distribution of Kolkata bound commuters belongs to this type of curve as there are maximum number of commuters during the peak hours in the morning and in the evening.

The J-shaped curve starts with a minimum frequency and then gradually reaches its maximum frequency at the other extremity. The distribution of commuters coming to Kolkata from the early morning hour to peak morning hour follows such a distribution. Sometimes, we may also come across an inverted J-shaped frequency curve.

Lastly, we may have a combination of these frequency curves, known as mixed curve. These are exhibited in the following figures.

Unit 1 Exercise
Set A

Que 1. Which of the following statements is false?

(a) Statistics is derived from the Latin word ‘Status’

(b) Statistics is derived from the Italian word ‘Statista’

(c) Statistics is derived from the French word ‘Statistik’

(d) None of these.

C

Que 2. Statistics is defined in terms of numerical data in the

(a) Singular sense

(b) Plural sense

(c) Either (a) or (b)

(d) Both (a) and (b).

b

Que 4. Statistics is concerned with

(a) Qualitative information

(b) Quantitative information

(c) (a) or (b)

(d) Both (a) and (b).

d

Que 5. An attribute is

(a) A qualitative characteristic

(b) A quantitative characteristic

(c) A measurable characteristic

(d) All these.

a

Que 6. Annual income of a person is

(a) An attribute

(b) A discrete variable

(c) A continuous variable

(d) (b) or (c).

b

Que 7. **Marks of a student is an example of**

(a) An attribute

(b) A discrete variable

(c) A continuous variable

(d) None of these.

b

Que. 8 Nationality of a student is

(a) An attribute

(b) A continuous variable

(c) A discrete variable

(d) (a) or (c).

a

Que 10. Age of a person is

(a) An attribute

(b) A discrete variable

(c) A continuous variable

(d) A variable.

C

Que 11. Data collected on religion from the census reports are

(a) Primary data

(b) Secondary data

(c) Sample data

(d) (a) or (b).

b

Que.12 The data collected on the height of a group of students after recording their heights with a measuring tape are

(a) Primary data

(b) Secondary data

(c) Discrete data

(d) Continuous data.

a

Que 13. The primary data are collected by

(a) Interview method

(b) Observation method

(c) Questionnaire method

(d) All these.

d

Que 14. The quickest method to collect primary data is

(a) Personal interview

(b) Indirect interview

(c) Telephone interview

(d) By observation.

C

Que 15. The best method to collect data, in case of a natural calamity, is

(a) Personal interview

(b) Indirect interview

(c) Questionnaire method

(d) Direct observation method.

a

Que 16. In case of a rail accident, the appropriate method of data collection is by

(a) Personal interview

(b) Direct interview

(c) Indirect interview

(d) All these.

C

Que 17. **Which method of data collection covers the widest area?**

(a) Telephone interview method

(b) Mailed questionnaire method

(c) Direct interview method

(d) All these.

b

Que 18. The amount of non-responses is maximum in

(a) Mailed questionnaire method

(b) Interview method

(c) Observation method

(d) All these.

a

Que 19. Some important sources of secondary data are

(a) International and Government sources

(b) International and primary sources

(c) Private and primary sources

(d) Government sources.

a

Que 20. Internal consistency of the collected data can be checked when

(a) Internal data are given

(b) External data are given

(c) Two or more series are given

(d) A number of related series are given.

d

Que 21. The accuracy and consistency of data can be verified by

(a) Internal checking

(b) External checking

(c) Scrutiny

(d) Both (a) and (b).

C

Que22. The mode of presentation of data are

(a) Textual, tabulation and diagrammatic

(b) Tabular, internal and external

(c) Textual, tabular and internal

(d) Tabular, textual and external.

a

Que23. The best method of presentation of data is

(a) Textual

(b) Tabular

(c) Diagrammatic

(d) (b) and (c).

b

Que24. The most attractive method of data presentation is

(a) Tabular

(b) Textual

(c) Diagrammatic

(d) (a) or (b).

C

Que 25. For tabulation, 'caption' is

(a) The upper part of the table

(b) The lower part of the table

(c) The main part of the table

(d) The upper part of a table that describes the column and sub-column.

d

Que 26. 'Stub' of a table is the

(a) Left part of the table describing the columns

(b) Right part of the table describing the columns

(c) Right part of the table describing the rows

(d) Left part of the table describing the rows.

d

Que 27. The entire upper part of a table is known as

(a) Caption

(b) Stub

(c) Box head

(d) Body.

C

Que28. **The unit of measurement in tabulation is shown in**

(a) Box head

(b) Body

(c) Caption

(d) Stub.

a

Que 29. In tabulation source of the data, if any, is shown in the

(a) Footnote

(b) Body

(c) Stub

(d) Caption.

a

Que 30. Which of the following statements is untrue for tabulation?

(a) Statistical analysis of data requires tabulation

(b) It facilitates comparison between rows and not columns

(c) Complicated data can be presented

(d) Diagrammatic representation of data requires tabulation.

b

Que 31. Hidden trend, if any, in the data can be noticed in

(a) Textual presentation

(b) Tabulation

(c) Diagrammatic representation

(d) All these.

C

Que. 32 Diagrammatic representation of data is done by

(a) Diagrams

(b) Charts

(c) Pictures

(d) All these.

d

Que33. The most accurate mode of data presentation is

(a) Diagrammatic method

(b) Tabulation

(c) Textual presentation

(d) None of these.

b

Que 34. The chart that uses logarithm of the variable is known as

(a) Line chart

(b) Ratio chart

(c) Multiple line chart

(d) Component line chart.

b

Que 35. Multiple line chart is applied for

(a) Showing multiple charts

(b) Two or more related time series when the variables are expressed in the same unit

(c) Two or more related time series when the variables are expressed in different unit

(d) Multiple variations in the time series.

b

Que 36. Multiple axis line chart is considered when

(a) There is more than one time series

(b) The units of the variables are different

(c) (a) or (b)

(d) (a) and (b).

d

Que 37. Horizontal bar diagram is used for

(a) Qualitative data

(b) Data varying over time

(c) Data varying over space

(d) (a) or (c).

d

Que 38. Vertical bar diagram is applicable when

(a) The data are qualitative

(b) The data are quantitative

(c) When the data vary over time

(d) (b) or (c).

d

Que 39. Divided bar chart is considered for

(a) Comparing different components of a variable

(b) The relation of different components to the table

(c) (a) or (b)

(d) (a) and (b).

d

Que 40. In order to compare two or more related series, we consider

(a) Multiple bar chart

(b) Grouped bar chart

(c) (a) or (b)

(d) (a) and (b).

C

Que 41 Pie-diagram is used for

(a) Comparing different components and their relation to the total

(b) Representing qualitative data in a circle

(c) Representing quantitative data in circle

(d) (b) or (c).

a

Que 42. A frequency distribution

(a) Arranges observations in an increasing order

(b)Arranges observation in terms of a number of groups

(c) Relates to a measurable characteristics

(d) All of these

d

Que 43. The frequency distribution of a continuous variable is known as

(a) Grouped frequency distribution

(b) Simple frequency distribution

(c) (a) or (b)

(d) (a) and (b).

a

Que 44. The distribution of shares is an example of the frequency distribution of

(a) A discrete variable

(b) A continuous variable

(c) An attribute

(d) (a) or (c).

a

Que 45. The distribution of profits of a blue-chip company relates to

(a) Discrete variable

(b) Continuous variable

(c) Attributes

(d) (a) or (b).

b

Que 46. **Mutually exclusive classification**

(a) Excludes both the class limits

(b) Excludes the upper class limit but includes the lower class limit

(c) Includes the upper class limit but excludes the upper class limit

(d) Either (b) or (c).

b

Que 47. **Mutually inclusive classification is usually meant for**

(a) A discrete variable

(b) A continuous variable

(c) An attribute

(d) All these.

a

Que 48. Mutually exclusive classification is usually meant for

(a) A discrete variable

(b) A continuous variable

(c) An attribute

(d) Any of these.

b

Que 49. The LCB is

(a) An upper limit to LCL

(b) A lower limit to LCL

(c) (a) and (b)

(d) (a) or (b).

b

Que 50. The UCB is

(a) An upper limit to UCL

(b) A lower limit to LCL

(c) Both (a) and (b)

(d) (a) or (b).

a

Que 51. length of a class is

(a) The difference between the UCB and LCB of that class

(b) The difference between the UCL and LCL of that class

(c) (a) or (b)

(d) Both (a) and (b).

a

Que 52. For a particular class boundary, the less than cumulative frequency and more than cumulative frequency add up to

(a) Total frequency

(b) Fifty per cent of the total frequency

(c) (a) or (b)

(d) None of these.

a

Que 53. Frequency density corresponding to a class interval is the ratio of

(a) Class frequency to the total frequency

(b) Class frequency to the class length

(c) Class length to the class frequency

(d) Class frequency to the cumulative frequency.

b

Que 54. Relative frequency for a particular class

(a) Lies between 0 and 1

(b) Lies between 0 and 1, both inclusive

(c) Lies between –1 and 0

(d) Lies between –1 to 1.

a

Que 55. Mode of a distribution can be obtained from

(a) Histogram

(b) Less than type ogives

(c) More than type ogives

(d) Frequency polygon.

a

Que 56. Median of a distribution can be obtained from

(a) Frequency polygon

(b) Histogram

(c) Less than type ogives

(d) None of these.

C

Que 57. A comparison among the class frequencies is possible only in

(a) Frequency polygon

(b) Histogram

(c) Ogives

(d) (a) or (b).

b

Que 58. Frequency curve is a limiting form of

(a) Frequency polygon

(b) Histogram

(c) (a) or (b)

(d) (a) and (b).

C

Que 59. Most of the commonly used frequency curves are

(a) Mixed

(b) Inverted J-shaped

(c) U-shaped

(d) Bell-shaped.

d

Que 60. The distribution of profits of a company follows

(a) J-shaped frequency curve

(b) U-shaped frequency curve

(c) Bell-shaped frequency curve

(d) Any of these.

C

PRINCIPLES OF SAMPLE SURVEY

LAW OF STATISTICAL REGULARITY :

If a sample of fairly large size is drawn from the population under discussion at random, then on an average the sample would possess the characteristics of that population.

PRINCIPLE OF INERTIA

As sample size increases , the results are likely to be more reliable , accurate and precise , provided other factors are kept constant

PRINCIPLE OF OPTIMISATION :

The principle of optimization ensures that an optimum level of efficiency at a minimum cost or the maximum efficiency at a given level of cost can be achieved with the selection of an appropriate sampling design.

PRINCIPLE OF VALIDITY :

The principle of validity states that a sampling design is valid only if it is possible to obtain valid estimates and valid tests about population parameters.

Only a probability sampling ensures this validity.

TYPES OF ERROR

SAMPLING ERROR

Every sampling design is subjected to this type of errors

NON SAMPLING ERROR

This type of errors happen both in sampling and complete enumeration

TYPES OF SAMPLING

PROBABILITY SAMPLING

- simple random sampling ,
- stratified sampling,
- Multi Stage sampling,
- Multi Phase Sampling,
- Cluster Sampling

MIXED SAMPLING

Systematic sampling

NON - PROBABILITY SAMPLING

Non-probability sampling is also known as Purposive or Judgemental Sampling

- SAMPLING FLUCTUATION is the variation in the value of a statistic computed from different samples .
- SAMPLING DISTRIBUTION is the probability distribution of a given statistic
- The mean of the statistic, as obtained from its sampling distribution, is known as "Expectation"
- standard deviation of the statistic is known as the "Standard Error (SE)" .
- SE can be regarded as a measure of precision achieved by sampling.

- Starting with a population of N units, we can draw many a sample of a fixed size n.
- In case of sampling with replacement, the total number of samples that can be drawn is N^n
- When it comes to sampling without replacement , the total number of samples that can be drawn is ${}^{N}C_{n}$

Answer the following questions. Each question carries one mark.

Que. 1 Sampling can be described as a statistical procedure

(a) To infer about the unknown universe from a knowledge of any sample

(b) To infer about the known universe from a knowledge of a sample drawn from it

(c) To infer about the unknown universe from a knowledge of a random sample drawn from it

(d) Both (a) and (b).

C

Answer the following questions. Each question carries one mark.

Que. 2 The Law of Statistical Regularity says that

(a) Sample drawn from the population under discussion possesses the characteristics of the population

(b) A large sample drawn at random from the population would possess the characteristics of the population

(c) A large sample drawn at random from the population would possess the characteristics of the population on an average

(d) An optimum level of efficiency can be attained at a minimum cost.

C

Answer the following questions. Each question carries one mark.

Que. 3 A sample survey is prone to

(a) Sampling errors

(b) Non-sampling errors

(c) Either (a) or (b)

(d) Both (a) and (b)

d

Answer the following questions. Each question carries one mark.

Que. 4 The population of roses in Salt Lake City is an example of

(a) A FInite population

(b) An infinite population

(c) A hypothetical population

(d) An imaginary population.

b

Answer the following questions. Each question carries one mark.

Que. 5 **Statistical decision about an unknown universe is taken on the basis of**

(a) Sample observations

(b) A sampling frame

(c) Sample survey

(d) Complete enumeration

a

Answer the following questions. Each question carries one mark.

Que. 6 Random sampling implies

(a) Haphazard sampling

(b) Probability sampling

(c) Systematic sampling

(d) Sampling with the same probability for each unit.

d

Answer the following questions. Each question carries one mark.

Que. 7 **A parameter is a characteristic of**

(a) Population

(b) Sample

(c) Both (a) and (b)

(d) (a) or (b)

a

Answer the following questions. Each question carries one mark.

Que. 8 **A statistic is**

(a) A function of sample observations

(b) A function of population units

(c) A characteristic of a population

(d) A part of a population.

a

Answer the following questions. Each question carries one mark.

Que. 9 Sampling Fluctuations may be described as

(a) The variation in the values of a statistic

(b) The variation in the values of a sample

(c) The differences in the values of a parameter

(d) The variation in the values of observations.

a

Answer the following questions. Each question carries one mark.

Que. 10 The sampling distribution is

(a) The distribution of sample observations

(b) The distribution of random samples

(c) The distribution of a parameter

(d) The probability distribution of a statistic.

d

Answer the following questions. Each question carries one mark.

Que. 11 Standard error can be described as

(a) The error committed in sampling

(b) The error committed in sample survey

(c) The error committed in estimating a parameter

(d) Standard deviation of a statistic.

d

Answer the following questions. Each question carries one mark.

Que. 12 A measure of precision obtained by sampling is given by

(a) Standard error

(b) Sampling fluctuation

(c) Sampling distribution

(d) Expectation.

a

Answer the following questions. Each question carries one mark.

Que. 13 As the sample size increases, standard error

(a) Increases

(b) Decreases

(c) Remains constant

(d) Decreases proportionally.

b

Answer the following questions. Each question carries one mark.

Que. 14 If from a population with 25 members, a random sample without replacement of 2 members is taken, the number of all such samples is

(a) 300

(b) 625

(c) 50

(d) 600

a

Answer the following questions. Each question carries one mark.

Que. 15 **A population comprises 5 members. The number of all possible samples of size 2 that can be drawn from it with replacement is**

(a) 100

(b) 15

(c) 125

(d) 25

d

Answer the following questions. Each question carries one mark.

Que. 16 Simple random sampling is very effective if

(a) The population is not very large

(b) The population is not much heterogeneous

(c) The population is partitioned into several sections.

(d) Both (a) and (b)

d

Answer the following questions. Each question carries one mark.

Que. 17 Simple random sampling is

(a) A probabilistic sampling

(b) A non- probabilistic sampling

(c) A mixed sampling

(d) Both (b) and (c).

a

- There are two types of allocation of sample size.

- “Proportional allocation” or “Bowely’s allocation
- When there is not much variation between the strata variances
- sample sizes for different strata are taken as proportional to the population sizes.

- “Neyman’s allocation”
- When the strata-variances differ significantly among themselves
- sample size vary jointly with population size and population standard deviation

Answer the following questions. Each question carries one mark.

Que. 18 According to Neyman's allocation, in stratified sampling

(a) Sample size is proportional to the population size

(b) Sample size is proportional to the sample SD

(c) Sample size is proportional to the sample variance

(d) Population size is proportional to the sample variance.

a

Answer the following questions. Each question carries one mark.

Que. 19 Which sampling provides separate estimates for population means for different segments and also an over all estimate?

(a) Multistage sampling

(b) Stratified sampling

(c) Simple random sampling

(d) Systematic sampling

b

Answer the following questions. Each question carries one mark.

Que. 20 Which sampling adds flexibility to the sampling process?

(a) Simple random sampling

(b) Multistage sampling

(c) Stratified sampling

(d) Systematic sampling

b

Answer the following questions. Each question carries one mark.

Que. 21 Which sampling is affected most if the sampling frame contains an undetected periodicity?

(a) Simple random sampling

(b) Stratified sampling

(c) Multistage sampling

(d) Systematic sampling

d

Answer the following questions. Each question carries one mark.

Que. 22 Which sampling is subjected to the discretion of the sampler?

(a) Systematic sampling

(b) Simple random sampling

(c) Purposive sampling

(d) Quota sampling.

C

Different Measures of Central Tendency

Mean

- Arithmetic Mean
- Geometric Mean
- Harmonic Mean

Partition Values

- Median
- Quartiles
- Deciles
- Percentiles

Mode

MATHS

ARITHMETIC MEAN

Discrete Observation

$$\bar{X} = \frac{x_1 + x_2 + x_3 + \dots\dots\dots\dots + x_n}{n}$$

$$= \frac{\sum_{i=1}^{n} x_i}{n}$$

Simple Frequency Distribution

$$\bar{x} = \frac{f_1 x_1 + f_2 x_2 + f_3 x_3 + \dots\dots\dots\dots + f_n x_n}{f_1 + f_2 + f_3 + \dots\dots\dots\dots + f_n}$$

$$= \frac{\sum f_i x_i}{\sum f_i}$$

$$\bar{X} = \frac{\sum f_i x_i}{N}$$

where ,

$N = \Sigma f_i$.

Grouped Frequency Distribution

$$\bar{X} = \frac{\sum f_i x_i}{N}$$

where ,

x_i= mid point of class interval

$N = \Sigma f_i$.

GEOMETRIC MEAN

Average Rates , percentage s

- For a given set of n positive observations, the geometric mean is defined as the n-th root of the product of the observations.

Discrete Observation

$$G = (x_1 \times x_2 \times x_3 \ldots\ldots\ldots\ldots \times x_n)^{1/n}$$

Frequency Distribution

$$G = (x_1^{f_1} \times x_2^{f_2} \times x_3^{f_3} \ldots\ldots\ldots\ldots\ldots\ldots \times x_n^{f_n})^{1/N}$$

HARMONIC MEAN

Average Rates ,SPEED

- For a given set of non-zero observations, harmonic mean is defined as the reciprocal of the AM of the reciprocals of the observation.

Discrete Observation

$$H = \frac{n}{\Sigma(1/x_i)}$$

Frequency Distribution

$$H = \frac{N}{\Sigma\left[\frac{f_i}{x_i}\right]}$$

COMBINED ARITHMETIC MEAN

$$\bar{x} = \frac{n_1\bar{x}_1 + n_2\bar{x}_2}{n_1 + n_2}$$

COMBINED HARMONIC MEAN

$$\frac{n_1 + n_2}{\frac{n_1}{H_1} + \frac{n_2}{H_2}}$$

RELATION BETWEEN AM ,GM ,HM

When all the observations are distinct → $AM > GM > HM$

When all the observations are same → $AM = GM = HM$

When nothing is mentioned → $AM \geq GM \geq HM$

RELATION BETWEEN AM ,GM ,HM

$$GM^2 = AM \times HM$$

This result holds for only two positive observations

- If all the values assumed by a variable are constant , say k , then the AM ,GM HM is also k .

HM of 1,1/2, 1/3,.................1/n is given by

$$\frac{2}{(n+1)}$$

- To calculate Average speed , use Harmonic Mean .

  The harmonic mean of two numbers x and y is given by $$\frac{2xy}{x+y}$$

MEDIAN – PARTITION VALUE

FOR DISCRETE OBSERVATION

$$\text{Median} = \begin{cases} \left(\dfrac{n+1}{2}\right)\text{th observation, if } n \text{ is odd} \\[2ex] \dfrac{\left(\dfrac{n}{2}\right)\text{th observation} + \left(\dfrac{n}{2}+1\right)\text{th observation}}{2}, \text{ if } n \text{ is even} \end{cases}$$

FOR SIMPLE FREQUENCY DISTRIBUTION

- Arrange the series into ascending or descending order.
- Calculate cumulative frequency .
- Calculate $\dfrac{N+1}{2}$
- Check cumulative frequency which is greater than $\dfrac{N+1}{2}$
- The value of x corresponding to this cumulative frequency would be the median .

FOR GROUPED FREQUENCY DISTRIBUTION

Compute the median using the formula:

$$\text{Median, } M_e = l + \left\{ h \times \frac{\left(\frac{N}{2} - cf\right)}{f} \right\}, \text{ where}$$

l = lower limit of median class;

h = width of median class;

f = frequency of median class;

cf = cumulative frequency of the class preceding the median class;

$N = \Sigma f_i$.

PARTITION VALUE

DISCRETE OBSERVATIONS

$(n + 1)\, p^{th}$ term

Where

n denotes the total number of observations

- **p = 1/4, 2/4, 3/4 for Q_1, Q_2 and Q_3 respectively.**
- **p = 1/10, 2/10,............9/10. For D_1, D_2,......,D_9 respectively.**
- **p = 1/100, 2/100,....,99/100 for P_1, P_2, P_3....P_{99} respectively.**

MODE

Find the class interval with the highest frequency

.

This class interval is called MODAL CLASS

$$\text{Mode} = l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times h$$

where l = lower limit of the modal class,

[redacted] ning all class sizes to be equal),

f_1 = frequency of the modal class,

f_0 = frequency of the class preceding the modal class,

f_2 = frequency of the class succeeding the modal class.

RELATIONSHIP BETWEEN MEAN , MODE AND MEDIAN

FOR SYMMETRIC DATA

Mean = Median = Mode

In case of MODERATELY SKEWED DISTRIBUTION
(EMPIRICAL RELATIONSHIP)

Mean – Mode = 3(Mean – Median)

Or

Mode = 3 Median – 2 Mean

the algebraic sum of deviations of a set of observations from their AM is zero

i.e. for unclassified data, $\sum(x_i - \bar{x}) = 0$ ....(14.1.4)

- **For a set of observations, the sum of absolute deviations is minimum when the deviations are taken from the median.**

  $\Sigma |x_i - A|$ is minimum if we choose A as the median.

- **AM is affected both due to change of origin and scale.**

  If $y = a + b\,x$ then $\bar{y} = a + b\bar{x}$.

- **If x and y are two variables, to be related by $y = a + bx$ for any two constants a and b, then the median of y is given by**

  $y_{me} = a + b\,x_{me}$

- **Mode is affected due to change in scale and due to change in origin .**

  if $y = a + bx$, then $y_{mo} = a + bx_{mo}$

Choose the most appropriate option (a) (b) (c) or (d).

Que. 1 Measures of central tendency for a given set of observations measures

(a) The scatterness of the observations

(b) The central location of the observations

(c) Both (a) and (b)

(d) None of these.

b

Choose the most appropriate option (a) (b) (c) or (d).

Que. 2 While computing the AM from a grouped frequency distribution, we assume that

(a) The classes are of equal length

(b) The classes have equal frequency

(c) All the values of a class are equal to the mid-value of that class

(d) None of these.

C

Choose the most appropriate option (a) (b) (c) or (d).

Que. 3 Which of the following statements is wrong?

(a) Mean is rigidly defined

(b) Mean is not affected due to sampling fluctuations

(c) Mean has some mathematical properties

(d) All these

b

Choose the most appropriate option (a) (b) (c) or (d).

Que. 4 Which of the following statements is true?

(a) Usually mean is the best measure of central tendency

(b) Usually median is the best measure of central tendency

(c) Usually mode is the best measure of central tendency

(d) Normally GM is the best measure of central tendency

a

Choose the most appropriate option (a) (b) (c) or (d).

Que. 5 For open-end classification, which of the following is the best measure of central tendency?

(a) AM

(b) GM

(c) Median

(d) Mode

C

Choose the most appropriate option (a) (b) (c) or (d).

Que. 6 The presence of extreme observations does not affect

(a) AM

(b) Median

(c) Mode

(d) Any of these.

b

Choose the most appropriate option (a) (b) (c) or (d).

Que. 7 In case of an even number of observations which of the following is median?

(a) Any of the two middle-most value

(b) The simple average of these two middle values

(c) The weighted average of these two middle values

(d) Any of these

b

Choose the most appropriate option (a) (b) (c) or (d).

Que. 8 The most commonly used measure of central tendency is

(a) AM

(b) Median

(c) Mode

(d) Both GM and HM.

a

Choose the most appropriate option (a) (b) (c) or (d).

Que. 9 Which one of the following is not uniquely defined?

(a) Mean

(b) Median

(c) Mode

(d) All of these measures

C

Choose the most appropriate option (a) (b) (c) or (d).

Que. 10 Which of the following measure of the central tendency is difficult to compute?

(a) Mean

(b) Median

(c) Mode

(d) GM

d

Choose the most appropriate option (a) (b) (c) or (d).

Que. 11 Which measure(s) of central tendency is(are) considered for finding the average rates?

(a) AM

(b) GM

(c) HM

(d) Both (b) and (c)

d

Choose the most appropriate option (a) (b) (c) or (d).

Que. 12 For a moderately skewed distribution, which of the following relationship holds?

(a) Mean – Mode = 3 (Mean – Median)

(b) Median – Mode = 3 (Mean – Median)

(c) Mean – Median = 3 (Mean – Mode)

(d) Mean – Median = 3 (Median – Mode)

a

Choose the most appropriate option (a) (b) (c) or (d).

Que. 13 **Weighted averages are considered when**

(a) The data are not classified

(b) The data are put in the form of grouped frequency distribution

(c) All the observations are not of equal importance

(d) Both (a) and (c).

C

Choose the most appropriate option (a) (b) (c) or (d).

Que. 14 Which of the following results hold for a set of distinct positive observations?

(a) AM $\geq$ GM $\geq$ HM

(b) HM $\geq$ GM $\geq$ AM

(c) AM > GM > HM

(d) GM > AM > HM

C

Choose the most appropriate option (a) (b) (c) or (d).

Que. 15 When a firm registers both profits and losses, which of the following measure of central tendency cannot be considered?

(a) AM

(b) GM

(c) Median

(d) Mode

b

Choose the most appropriate option (a) (b) (c) or (d).

Que. 16 Quartiles are the values dividing a given set of observations into

(a) Two equal parts

(b) Four equal parts

(c) Five equal parts

(d) None of these

b

Choose the most appropriate option (a) (b) (c) or (d).

Que. 17 Quartiles can be determined graphically using

(a) Histogram

(b) Frequency Polygon

(c) Ogive

(d) Pie chart.

C

Choose the most appropriate option (a) (b) (c) or (d).

Que. 18 Which of the following measure(s) possesses (possess) mathematical properties?

(a) AM

(b) GM

(c) HM

(d) All of these

d

Choose the most appropriate option (a) (b) (c) or (d).

Que. 19 Which of the following measure(s) satisfies (satisfy) a linear relationship between two variables?

(a) Mean

(b) Median

(c) Mode

(d) All of these

d

Choose the most appropriate option (a) (b) (c) or (d).

Que. 20 Which of The following measures of central tendency is based on only fifty percent of the central values?

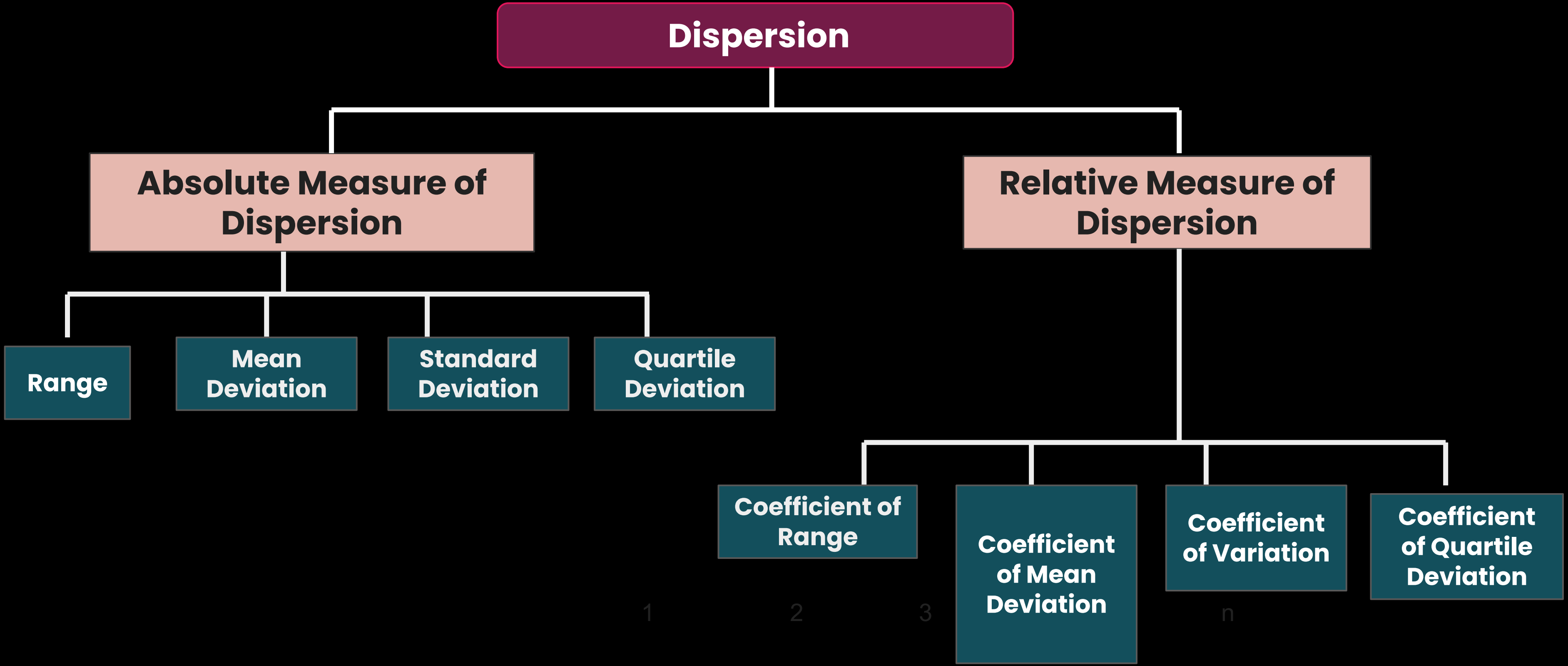
(a) Mean

(b) Median

(c) Mode

(d) Both (a) and (b)

b


Dispersion
Absolute Measure of Dispersion
Relative Measure of Dispersion
Range
Mean Deviation
Standard Deviation
Quartile Deviation
Coefficient of Range
Coefficient of Mean Deviation
Coefficient of Variation
Coefficient of Quartile Deviation

RANGE

Discrete Observation

Range = L – S

Where ,

L : largest observations

S : smallest observations

COEFFICIENT OF RANGE

$$\text{Coefficient of range} = \frac{L-S}{L+S} \times 100$$

RANGE

Grouped Frequency distribution

Range = Uppermost Class Boundary – Lowermost Class Boundary

COEFFICIENT OF RANGE

$$\frac{\text{Uppermost class boundary} - \text{Lowermost class boundary}}{\text{Uppermost class boundary} + \text{Lowermost class boundary}} \times 100$$

MEAN DEVIATION

Discrete Observation

$$MD_A = \frac{1}{n}\Sigma|x_i - A|$$

Frequency Distribution

$$MD_A = \frac{1}{N}\Sigma f\,|x - A|$$

COEFFICIENT OF Mean deviation

$$\text{Coefficient of mean deviation} = \frac{\text{Mean deviation about A}}{\text{A}} \times 100$$

- **Mean Deviation takes its minimum value when deviations are taken from Median**

STANDARD DEVIATION

DISCRETE OBSERVATION

$$s = \sqrt{\frac{\sum (x_i - \bar{x})^2}{n}}$$

Or

$$s = \sqrt{\frac{\sum x_i^{\,2}}{n} - \bar{x}^2}$$

FREQUENCY DISTRIBUTION

$$s = \sqrt{\frac{\sum f_i (x_i - \bar{x})^2}{N}}$$

Or

$$\sqrt{\frac{\sum f_i x_i^{\,2}}{N} - \bar{x}^2}$$

$$\text{Coefficient of Variation (CV)} = \frac{SD}{AM} \times 100$$

SD for any two numbers

$$S = \frac{\text{Range}}{2}$$

SD for first n natural numbers

$$\sqrt{\frac{n^2 - 1}{12}}.$$

QUARTILE DEVIATION

- Another measure of dispersion is provided by quartile deviation or semi-inter - quartile range which is given by

$$Q_d = \frac{Q_3 - Q_1}{2}$$

$$\text{Coefficient of quartile deviation} = \frac{Q_3 - Q_1}{Q_3 + Q_1} \times 100$$

RELATIONSHIP BETWEEN SD, MD AND QD

4 SD = 5 MD = 6 QD

Or

SD : MD : QD = 15 : 12 : 10

If all the observations are constant i.e. equal, then the range ,MD ,SD , is zero.

Range , MD ,SD ,QD remains unaffected due to a change of origin but affected in the same ratio due to a change in scale .

$y = a + bx$,

- $R_y = |b| \times R_x$
- $MD_Y = |b| \times MD_x$
- $S_y = |b| S_x$
- $QD_Y = |b| \times QD_x$

Write down the correct answers. Each question carries one mark.

Que. 1 **Which of the following statements is correct?**

(a) **Two distributions may have identical measures of central tendency and dispersion.**

(b) **Two distributions may have the identical measures of central tendency but different measures of dispersion.**

(c) **Two distributions may have the different measures of central tendency but identical measures of dispersion.**

(d) **All the statements (a), (b) and (c).**

d

Write down the correct answers. Each question carries one mark.

Que. 2 **Dispersion measures**

(a) The scatterness of a set of observations

(b) The concentration of a set of observations

(c) Both (a) and (b)

(d) Neither (a) and (b).

a

Write down the correct answers. Each question carries one mark.

Que. 3 When it comes to comparing two or more distributions we consider

(a) Absolute measures of dispersion

(b) Relative measures of dispersion

(c) Both (a) and (b)

(d) Either (a) or (b).

b

Write down the correct answers. Each question carries one mark.

Que. 4 Which one is easiest to compute?

(a) Relative measures of dispersion

(b) Absolute measures of dispersion

(c) Both (a) and (b)

(d) Range

d

Write down the correct answers. Each question carries one mark.

Que. 5 Which one is an absolute measure of dispersion?

(a) Range

(b) Mean Deviation

(c) Standard Deviation

(d) All these measures

d

Write down the correct answers. Each question carries one mark.

Que. 6 Which measure of dispersion is most useful ?

(a) Standard deviation

(b) Quartile deviation

(c) Mean deviation

(d) Range

a

Write down the correct answers. Each question carries one mark.

Que. 7 Which measures of dispersions is not affected by the presence of extreme observations?

(a) Range

(b) Mean deviation

(c) Standard deviation

(d) Quartile deviation

d

Write down the correct answers. Each question carries one mark.

Que. 8 Which measure of dispersion is based on the absolute deviations only?

(a) Standard deviation

(b) Mean deviation

(c) Quartile deviation

(d) Range

b

Write down the correct answers. Each question carries one mark.

Que. 9 Which measure is based on only the central fifty percent of the observations?

(a) Standard deviation

(b) Quartile deviation

(c) Mean deviation

(d) All these measures

b

Write down the correct answers. Each question carries one mark.

Que. 10 Which measure of dispersion is based on all the observations?

(a) Mean deviation

(b) Standard deviation

(c) Quartile deviation

(d) (a) and (b) but not (c)

d

Write down the correct answers. Each question carries one mark.

Que. 11 The appropriate measure of dispersion for open-end classification is

(a) Standard deviation

(b) Mean deviation

(c) Quartile deviation

(d) All these measures.

C

Write down the correct answers. Each question carries one mark.

Que. 12 The most commonly used measure of dispersion is

(a) Range

(b) Standard deviation

(c) Coefficient of variation

(d) Quartile deviation.

b

Write down the correct answers. Each question carries one mark.

Que. 13 Which measure of dispersion has some desirable mathematical properties?

(a) Standard deviation

(b) Mean deviation

(c) Quartile deviation

(d) All these measures

a

Write down the correct answers. Each question carries one mark.

Que. 14 If the profits of a company remains the same for the last ten months, then the standard deviation of profits for these ten months would be ?

(a) Positive

(b) Negative

(c) Zero

(d) (a) or (c)

C

Write down the correct answers. Each question carries one mark.

Que. 15 Which measure of dispersion is considered for finding a pooled measure of dispersion after combining several groups?

(a) Mean deviation

(b) Standard deviation

(c) Quartile deviation

(d) Any of these

b

Write down the correct answers. Each question carries one mark.

Que. 16 A shift of origin has no impact on

(a) Range

(b) Mean deviation

(c) Standard deviation

(d) All these and quartile deviation.

d

Write down the correct answers. Each question carries one mark.

Que. 17 The range of 15, 12, 10, 9, 17, 20 is

(a) 5

(b) 12

(c) 13

(d) 11.

d

Write down the correct answers. Each question carries one mark.

Que. 18 The standard deviation of 10, 16, 10, 16, 10, 10, 16, 16 is

(a) 4

(b) 6

(c) 3

(d) 0.

C

If all observations have same frequency , then we can ignore frequency

Write down the correct answers. Each question carries one mark.

Que. 19 For any two numbers SD is always

(a) Twice the range

(b) Half of the range

(c) Square of the range

(d) None of these.

b

Write down the correct answers. Each question carries one mark.

Que. 20 If all the observations are increased by 10, then

(a) SD would be increased by 10

(b) Mean deviation would be increased by 10

(c) Quartile deviation would be increased by 10

(d) All these three remain unchanged.

d

Write down the correct answers. Each question carries one mark.

Que. 21 If all the observations are multiplied by 2, then

(a) New SD would be also multiplied by 2

(b) New SD would be half of the previous SD

(c) New SD would be increased by 2

(d) New SD would be decreased by 2.

a

WEIGHTED AGGREGATIVE INDEX

a. **Laspeyres' Index**: In this Index base year quantities are used as weights:

$$\text{Laspeyres Index} = \frac{\Sigma P_n Q_0}{\Sigma P_0 Q_0} \times 100$$

b **Paasche's Index:** In this Index current year quantities are used as weights:

$$\text{Passche's Index} = \frac{\Sigma P_n Q_n}{\Sigma P_o Q_n} \times 100$$

WEIGHTED AGGREGATIVE INDEX

C **The Marshall-Edgeworth index** uses this method by taking the **average** of the base year and the current year

$$\text{Marshall-Edgeworth Index} = \frac{\Sigma P_n (Q_o + Q_n)}{\Sigma P_o (Q_o + Q_n)} \times 100$$

d. **Fisher's ideal Price Index:** This index is the **geometric mean** of Laspeyres' and Paasche's.

$$\text{Fisher's Index} = \sqrt{\frac{\Sigma P_n Q_o}{\Sigma P_o Q_o} \times \frac{\Sigma P_n Q_n}{\Sigma P_o Q_n}} \times 100$$

WEIGHTED AGGREGATIVE INDEX

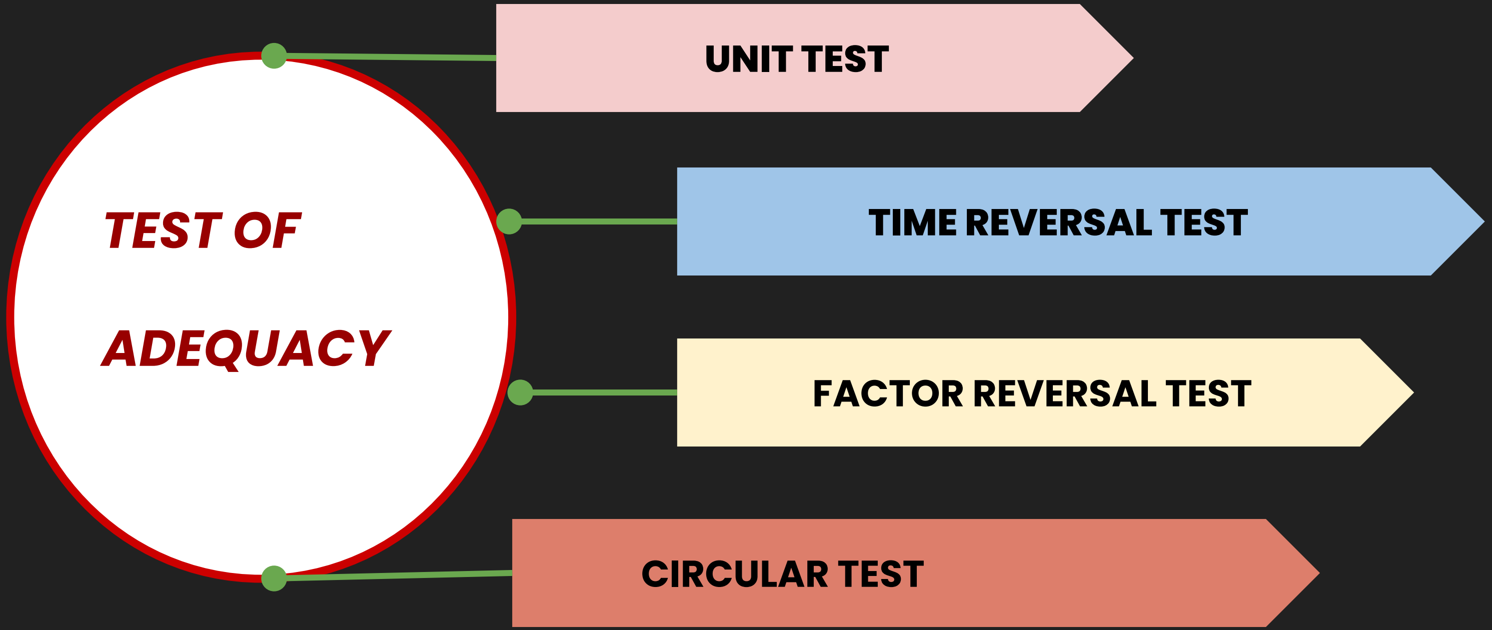
BOWLEY INDEX:

$$\frac{\text{Laspeyres' Index} + \text{Paasche's Index}}{2}$$

$$\text{Chain Index} = \frac{\text{Link relative of current year} \times \text{Chain Index of the previous year}}{100}$$

$$\text{Deflated Value} = \frac{\text{Current Value}}{\text{Price Index of the current year}}$$

$$\text{Shifted Price Index} = \frac{\text{Original Price Index}}{\text{Price Index of the year on which it has to be shifted}} \times 100$$


TEST OF
ADEQUACY
UNIT TEST
TIME REVERSAL TEST
FACTOR REVERSAL TEST
CIRCULAR TEST

UNIT TEST

This test requires that the formula should be independent of the unit

Except for the simple (unweighted) aggregative index all other formulae satisfy this test

TIME REVERSAL TEST

$$P_{01} \times P_{10} = 1$$

Laspeyres' method and Paasche's method do not satisfy this test, but Fisher's Ideal Formula does.

FACTOR REVERSAL TEST

$$P_{01} \times Q_{01} = V_{01}$$

Fisher's Index satisfies Factor Reversal test

CIRCULAR TEST

$$P_{01} \times P_{12} \times P_{20} = 1$$

shiftability of base

This test is not met by Laspeyres, or Paasche's or the Fisher's ideal index. simple geometric mean of price relatives and the weighted aggregative with fixed weights meet this test.

Choose the most appropriate option (a) (b) (c) or (d).

Que. 1 A series of numerical figures which show the relative position is called

a) index number

b) relative number

c) absolute number

d) none

a

Choose the most appropriate option (a) (b) (c) or (d).

Que. 2 Index number for the base period is always taken as

a) 200

b) 50

c) 1

d) 100

d

Choose the most appropriate option (a) (b) (c) or (d).

Que. 3 __________ **play a very important part in the construction of index numbers.**

a) weights

b) classes

c) estimations

d) none

a

Choose the most appropriate option (a) (b) (c) or (d).

Que. 4 _________ is particularly suitable for the construction of index numbers.

a) H.M.

b) A.M.

c) G.M.

d) none

C

Choose the most appropriate option (a) (b) (c) or (d).

Que. 5 Index numbers show __________ changes rather than absolute amounts of change.

a) relative

b) percentage

c) both

d) none

b

Choose the most appropriate option (a) (b) (c) or (d).

Que. 6 The _________ makes index numbers time-reversible.

a) A.M.

b) G.M.

c) H.M.

d) none

b

Choose the most appropriate option (a) (b) (c) or (d).

Que. 7 Price relative is equal to

a) $\dfrac{\text{Price in the given year} \times 100}{\text{Price in the base year}}$

b) $\dfrac{\text{Price in the year base year} \times 100}{\text{Price in the given year}}$

c) Price in the given year × 100

d) Price in the base year × 100

a

Choose the most appropriate option (a) (b) (c) or (d).

Que. 8 **Index number is equal to**

a) sum of price relatives

b) average of the price relatives

c) product of price relative

d) none

b

Choose the most appropriate option (a) (b) (c) or (d).

Que. 9 The _________ of group indices gives the General Index

a) H.M.

b) G.M.

c) A.M.

d) none

C

Choose the most appropriate option (a) (b) (c) or (d).

Que. 10 Circular Test is one of the tests of

a) index numbers

b) hypothesis

c) both

d) none

a

Choose the most appropriate option (a) (b) (c) or (d).

Que. 11 ____________ is an extension of time reversal test

a) Factor Reversal test

b) Circular test

c) both

d) none

b

Choose the most appropriate option (a) (b) (c) or (d).

Que. 13 Factor Reversal test is satisfied by

a) Fisher's Ideal Index

b) Laspeyres Index

c) Paasches Index

d) none

a

Choose the most appropriate option (a) (b) (c) or (d).

Que. 14 Laspeyre's formula does not satisfy

a) Factor Reversal Test

b) Time Reversal Test

c) Circular Test

d) all the above

d

Choose the most appropriate option (a) (b) (c) or (d).

Que. 15 A ratio or an average of ratios expressed as a percentage is called

a) a relative number

b) an absolute number

c) an index number

d) none

C

Choose the most appropriate option (a) (b) (c) or (d).

Que. 16 The value at the base time period serves as the standard point of comparison

a) false

b) true

c) both

d) none

b

Choose the most appropriate option (a) (b) (c) or (d).

Que. 17 An index time series is a list of ________ numbers for two or more periods of time

a) index

b) absolute

c) relative

d) none

a

Choose the most appropriate option (a) (b) (c) or (d).

Que. 18 Index numbers are often constructed from the

a) frequency

b) class

c) sample

d) none

C

Choose the most appropriate option (a) (b) (c) or (d).

Que. 19 _________ is a point of reference in comparing various data describing individual behaviour.

a) Sample

b) Base period

c) Estimation

d) none

b

Choose the most appropriate option (a) (b) (c) or (d).

Que. 20 **The ratio of price of single commodity in a given period to its price in the preceding year price is called the**

(a) base period

(b) price ratio

(c) relative price

(d) none

C

Choose the most appropriate option (a) (b) (c) or (d).

Que. 21 $\frac{\text{Sum of all commodity prices in the current year} \times 100}{\text{Sum of all commodity prices in the base year}}$ is

(a) Relative Price Index

(b) Simple Aggregative Price Index

(c) both

(d) none

b

Choose the most appropriate option (a) (b) (c) or (d).

Que. 22 Chain index is equal to

(a) $\dfrac{\text{link relative of current year} \times \text{chain index of the current year}}{100}$

(b) $\dfrac{\text{link relative of previous year} \times \text{chain index of the current year}}{100}$

(c) $\dfrac{\text{link relative of current year} \times \text{chain index of the previous year}}{100}$

(d) $\dfrac{\text{link relative of previous year} \times \text{chain index of the previous year}}{100}$

C

Choose the most appropriate option (a) (b) (c) or (d).

Que. 23 P_{01} is the index for time

(a) 1 on 0

(b) 0 on 1

(c) 1 on 1

(d) 0 on 0

a

Choose the most appropriate option (a) (b) (c) or (d).

Que. 24 P_{10} is the index for time

(a) 1 on 0

(b) 0 on 1

(c) 1 on 1

(d) 0 on 0

b

Choose the most appropriate option (a) (b) (c) or (d).

Que. 25 **When the product of price index and the quantity index is equal to the corresponding value index then the test that holds is**

(a) Unit Test

(b) Time Reversal Test

(c) Factor Reversal Test

(d) none holds

C

Choose the most appropriate option (a) (b) (c) or (d).

Que. 26 The formula should be independent of the unit in which or for which price and quantities are quoted in

(a) Unit Test

(b) Time Reversal Test

(c) Factor Reversal Test

(d) none

a

Choose the most appropriate option (a) (b) (c) or (d).

Que. 27 Laspeyre's method and Paasche’s method do not satisfy

(a) Unit Test

(b) Time Reversal Test

(c) Factor Reversal Test

(d) b & c

d

Choose the most appropriate option (a) (b) (c) or (d).

Que. 28 The purpose determines the type of index number to use

(a) yes

(b) no

(c) may be

(d) may not be

a

Choose the most appropriate option (a) (b) (c) or (d).

Que. 29 The index number is a special type of average

(a) false

(b) true

(c) both

(d) none

b

Choose the most appropriate option (a) (b) (c) or (d).

Que. 30 The choice of suitable base period is at best temporary solution

(a) true

(b) false

(c) both

(d) none

a

Choose the most appropriate option (a) (b) (c) or (d).

Que. 31 **Fisher's Ideal Formula for calculating index numbers satisfies the ________ tests**

(a) Unit Test

(b) Factor Reversal Test

(c) both

(d) none

C

Choose the most appropriate option (a) (b) (c) or (d).

Que. 32 Fisher’s Ideal Formula dose not satisfy __________ test

(a) Unit Test

(b) Circular Test

(c) Time Reversal Test

(d) none

b

Choose the most appropriate option (a) (b) (c) or (d).

Que. 33 ________________ satisfies circular test

a) G.M. of price relatives or the weighted aggregate with fixed weights

b) A.M. of price relatives or the weighted aggregate with fixed weights

c) H.M. of price relatives or the weighted aggregate with fixed weights

d) none

a

Choose the most appropriate option (a) (b) (c) or (d).

Que. 34 Laspeyre's and Paasche’s method __________ time reversal test

(a) satisfy

(b) do not satisfy

(c) are

(d) are not

b

Choose the most appropriate option (a) (b) (c) or (d).

Que. 35 There is no such thing as unweighted index numbers

(a) false

(b) true

(c) both

(d) none

a

Choose the most appropriate option (a) (b) (c) or (d).

Que. 36 Theoretically, G.M. is the best average in the construction of index numbers but in practice, mostly the A.M. is used

(a) false

(b) true

(c) both

(d) none

b

Choose the most appropriate option (a) (b) (c) or (d).

Que. 37 Laspeyre’s or Paasche’s or the Fisher’s ideal index do not satisfy

(a) Time Reversal Test

(b) Unit Test

(c) Circular Test

(d) none

C

Choose the most appropriate option (a) (b) (c) or (d).

Que. 38 _____________ is concerned with the measurement of price changes over a period of years, when it is desirable to shift the base

(a) Unit Test

(b) Circular Test

(c) Time Reversal Test

(d) none

b

Choose the most appropriate option (a) (b) (c) or (d).

Que. 39 The test of shifting the base is called

(a) Unit Test

(b) Time Reversal Test

(c) Circular Test

(d) none

C

Choose the most appropriate option (a) (b) (c) or (d).

Que. 40 **The formula for conversion to current value**

(a) $\text{Deflated value} = \dfrac{\text{Price Index of the current year}}{\text{previous value}}$

(b) $\text{Deflated value} = \dfrac{\text{current value}}{\text{Price Index of the current year}}$

(c) $\text{Deflated value} = \dfrac{\text{Price Index of the previous year}}{\text{previous value}}$

(d) $\text{Deflated value} = \dfrac{\text{Price Index of the previous year}}{\text{previous value}}$

b

Choose the most appropriate option (a) (b) (c) or (d).

Que. 41 **Shifted price Index =** $\dfrac{\text{Original Price} \times 100}{\text{Price Index of the year on which it has to be shifted}}$

(a) True

(b) false

(c) both

(d) none

a

Choose the most appropriate option (a) (b) (c) or (d).

Que. 42 The number of test of Adequacy is

(a) 2

(b) 5

(c) 3

(d) 4

d

Choose the most appropriate option (a) (b) (c) or (d).

Que. 43 We use price index numbers

(a) To measure and compare prices

(b) to measure prices

(c) to compare prices

(d) none

a

Choose the most appropriate option (a) (b) (c) or (d).

Que. 44 Simple aggregate of quantities is a type of

(a) Quantity control

(b) Quantity indices

(c) both

(d) none

b

- No . of cells = m x n

  where ,

  m = no. of class interval of x

  n = no. of class interval of y

- No . of Marginal Distributions in Bivariate data = 2

- No . of Conditional Distributions = m +n

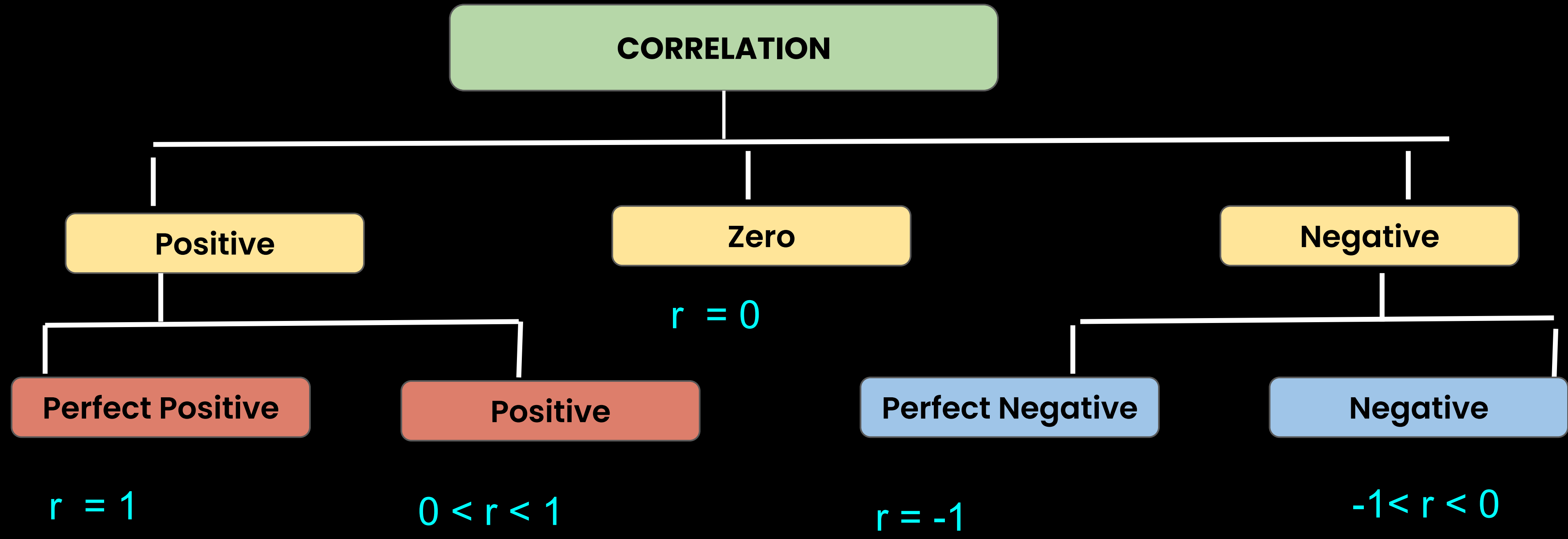
  where ,

  m = no. of class interval of x

  n = no. of class interval of y

Correlation

- Correlation is expressed using r
- The value of correlation ranges from - 1 to 1 , both inclusive $-1 \leq r \leq 1$.



KARL PEARSON'S PRODUCT MOMENT CORRELATION COEFFICIENT

$$r = r_{xy} = \frac{\text{Cov}(x, y)}{S_x \times S_y} \quad \text{.......................................}$$

where

$$\text{cov}(x, y) = \frac{\sum(x_i - \bar{x})(y_i - \bar{y})}{n} = \frac{\sum x_i y_i}{n} - \bar{x}\bar{y} \ldots$$

$$S_x = \sqrt{\frac{\sum(x_i - \bar{x})^2}{n}} = \sqrt{\frac{\sum x_i^2}{n} - \bar{x}^2} \quad \text{..................}$$

(i) The Coefficient of Correlation is a unit-free measure.

(ii) The coefficient of correlation always lies between –1 and 1, including both the limiting values $-1 \leq r \leq 1$.

(iii) If two variables are related by a linear equation , then correlation coefficient will always be perfect +1 or -1 depends on the sign of slope of equation .

PROPERTIES OF CORRELATION COEFFICIENT

- Change of Origin : NO Impact
- Change of Scale : No Impact of value but affected by sign

- If sign of both change of scale are same

$$r_{uv} = r_{xy}$$

- If sign of both change of scale are different

$$r_{uv} = -r_{xy}$$

SPEARMAN'S RANK CORRELATION COEFFICIENT

- When we need finding correlation between two qualitative characteristics, say, beauty and intelligence, we take recourse to using rank correlation coefficient.

$$r_R = 1 - \frac{6\sum d_i^2}{n(n^2-1)}$$

COEFFICIENT OF CONCURRENT DEVIATIONS

- A very simple and casual method of finding correlation when we are not serious about the magnitude of the two variables .

$$r_C = \pm\sqrt{\pm\frac{(2c-m)}{m}}$$

where c is the number of concurrent deviations (same direction)

m is number of pairs compared , m = n-1

Estimation of Y when X is given

Y on X

Y : Dependent

X : Independent

$$y = a + bx$$

Estimation of X when Y is given

X on Y

X : Dependent

Y : Independent

$$x = a + by$$

REGRESSION

Estimation of Y when X is given

Regression line of Y on X

$$Y - \overline{Y} = b_{yx}(X - \overline{X})$$

Estimation of X when Y is given

Regression line of X on Y

$$X - \overline{X} = b_{xy}(Y - \overline{Y})$$

METHOD OF LEAST SQUARES

REGRESSION COEFFICIENT

Regression Coefficient of Y on X

$$b_{yx} = \frac{Cov(x,y)}{\text{Var of } x}$$

$$b_{yx} = r \cdot \frac{SD_y}{SD_x}$$

REGRESSION COEFFICIENT

Regression Coefficient of X on Y

$$b_{xy} = \frac{Cov(x,y)}{\text{Var of } y}$$

$$b_{xy} = r \cdot \frac{SD_x}{SD_y}$$

Example If the relationship between two variables x and u is $u + 3x = 10$ and between two other variables y and v is

$2y + 5v = 25$, and the regression coefficient of y on x is known as 0.80, what would be the regression coefficient of v on u?

The regression coefficients remain unchanged due to a shift of origin but change due to a shift of scale.

- $b_{uv} = b_{xy} \cdot \dfrac{\text{change of scale of x}}{\text{Change of scale of y}}$
- $b_{vu} = b_{yx} \cdot \dfrac{\text{change of scale of y}}{\text{Change of scale of x}}$

PROPERTIES REGRESSION LINES / COEFFICIENTS

(ii) The two lines of regression intersect at the point $(\bar{x}, \bar{y})$ mean where x and y are the variables under consideration.

According to this property, the point of intersection of the regression line of y on x and the regression line of x on y is $(\bar{x}, \bar{y})$ i.e. the solution of the simultaneous equations in x and y.

PROPERTIES REGRESSION LINES / COEFFICIENTS

(iii) The coefficient of correlation between two variables x and y is the simple geometric mean of the two regression coefficients. The sign of the correlation coefficient would be the common sign of the two regression coefficients.

$$r = \pm\sqrt{b_{yx} \times b_{xy}}$$

If both the regression coefficients are negative, r would be negative and if both are positive, r would assume a positive value.

NOTE

- Product of the regression coefficient must be numerically less than unity .
- The two lines of regression coincide i.e. become identical when $r = -1$ or 1 or in other words, there is a perfect negative or positive correlation between the two variables under discussion.
- If $r = 0$ Regression lines are perpendicular to each other

Coefficient of Determination / Explained Variance / Accounted Variance = r^2

Coefficient of non-determination = $(1-r^2)$

Write the correct answers. Each question carries 1 mark.

Que. 1 Bivariate Data are the data collected for

(a) Two variables irrespective of time

(b) More than two variables

(c) Two variables at the same point of time

(d) Two variables at different points of time.

C

Write the correct answers. Each question carries 1 mark.

Que. 2 For a bivariate frequency table having $(p + q)$ classification the total number of cells is

(a) p

(b) $p + q$

(c) q

(d) pq

d

Write the correct answers. Each question carries 1 mark.

Que. 3 **Some of the cell frequencies in a bivariate frequency table may be**

(a) Negative

(b) Zero

(c) a or b

(d) None of these

b

Write the correct answers. Each question carries 1 mark.

Que. 4 For a p × q bivariate frequency table, the maximum number of marginal distributions is

(a) p

(b) p + q

(c) 1

(d) 2

d

Write the correct answers. Each question carries 1 mark.

Que. 5 For a $p \times q$ classification of bivariate data, the maximum number of conditional distributions is

(a) p

(b) $p + q$

(c) pq

(d) p or q

b

Write the correct answers. Each question carries 1 mark.

Que. 6 Correlation analysis aims at

(a) Predicting one variable for a given value of the other variable

(b) Establishing relation between two variables

(c) Measuring the extent of relation between two variables

(d) Both (b) and (c).

d

Write the correct answers. Each question carries 1 mark.

Que. 7 Regression analysis is concerned with

(a) Establishing a mathematical relationship between two variables

(b) Measuring the extent of association between two variables

(c) Predicting the value of the dependent variable for a given value of the independent variable

(d) Both (a) and (c).

d

Write the correct answers. Each question carries 1 mark.

Que. 8 **What is spurious correlation?**

(a) It is a bad relation between two variables.

(b) It is very low correlation between two variables.

(c) It is the correlation between two variables having no causal relation.

(d) It is a negative correlation.

C

Write the correct answers. Each question carries 1 mark.

Que. 9 Scatter diagram is considered for measuring

(a) Linear relationship between two variables

(b) Curvilinear relationship between two variables

(c) Neither (a) nor (b)

(d) Both (a) and (b).

d

Write the correct answers. Each question carries 1 mark.

Que. 10 If the plotted points in a scatter diagram lie from upper left to lower right, then the correlation is

(a) Positive

(b) Zero

(c) Negative

(d) None of these.

C

Write the correct answers. Each question carries 1 mark.

Que. 11 **If the plotted points in a scatter diagram are evenly distributed, then the correlation is**

(a) Zero

(b) Negative

(c) Positive

(d) (a) or (b).

a

Write the correct answers. Each question carries 1 mark.

Que. 12 If all the plotted points in a scatter diagram lie on a single line, then the correlation is

(a) Perfect positive

(b) Perfect negative

(c) Both (a) and (b)

(d) Either (a) or (b).

d

Write the correct answers. Each question carries 1 mark.

Que. 13 **The correlation between shoe-size and intelligence is**

(a) Zero

(b) Positive

(c) Negative

(d) None of these.

a

Write the correct answers. Each question carries 1 mark.

Que. 14 **The correlation between the speed of an automobile and the distance travelled by it after applying the brakes is**

(a) Negative

(b) Zero

(c) Positive

(d) None of these.

a

Write the correct answers. Each question carries 1 mark.

Que. 15 Scatter diagram helps us to

(a) Find the nature of correlation between two variables

(b) Compute the extent of correlation between two variables

(c) Obtain the mathematical relationship between two variables

(d) Both (a) and (c).

a

Write the correct answers. Each question carries 1 mark.

Que. 16 Pearson's correlation coefficient is used for finding

(a) Correlation for any type of relation

(b) Correlation for linear relation only

(c) Correlation for curvilinear relation only

(d) Both (b) and (c).

b

Write the correct answers. Each question carries 1 mark.

Que. 17 **Product moment correlation coefficient is considered for**

(a) Finding the nature of correlation

(b) Finding the amount of correlation

(c) Both (a) and (b)

(d) Either (a) and (b).

C

Write the correct answers. Each question carries 1 mark.

Que. 18 **If the value of correlation coefficient is positive, then the points in a scatter diagram tend to cluster**

(a) From lower left corner to upper right corner

(b) From lower left corner to lower right corner

(c) From lower right corner to upper left corner

(d) From lower right corner to upper right corner.

a

Write the correct answers. Each question carries 1 mark.

Que. 19 When $r = 1$, all the points in a scatter diagram would lie

(a) On a straight line directed from lower left to upper right

(b) On a straight line directed from upper left to lower right

(c) On a straight line

(d) Both (a) and (b).

a

Write the correct answers. Each question carries 1 mark.

Que. 20 Product moment correlation coefficient may be defined as the ratio of

(a) The product of standard deviations of the two variables to the covariance between them

(b) The covariance between the variables to the product of the variances of them

(c) The covariance between the variables to the product of their standard deviations

(d) Either (b) or (c).

C

Write the correct answers. Each question carries 1 mark.

Que. 21 **The covariance between two variables is**

(a) Strictly positive

(b) Strictly negative

(c) Always 0

(d) Either positive or negative or zero.

d

Write the correct answers. Each question carries 1 mark.

Que. 22 **The coefficient of correlation between two variables**

(a) Can have any unit.

(b) Is expressed as the product of units of the two variables

(c) Is a unit free measure

(d) None of these.

C

Write the correct answers. Each question carries 1 mark.

Que. 23 **What are the limits of the correlation coefficient?**

(a) No limit

(b) −1 and 1, excluding the limits

(c) 0 and 1, including the limits

(d) −1 and 1, including the limits

d

Write the correct answers. Each question carries 1 mark.

Que. 24 In case the correlation coefficient between two variables is 1, the relationship between the two variables would be

(a) $y = a + bx$

(b) $y = a + bx$, $b > 0$

(c) $y = a + bx$, $b < 0$

(d) $y = a + bx$, both a and b being positive.

b

Write the correct answers. Each question carries 1 mark.

Que. 25 If the relationship between two variables x and y is given by $2x + 3y + 4 = 0$, then the value of the correlation coefficient between x and y is

(a) 0

(b) 1

(c) −1

(d) negative.

C

Write the correct answers. Each question carries 1 mark.

Que. 26 For finding correlation between two attributes, we consider

(a) Pearson's correlation coefficient

(b) Scatter diagram

(c) Spearman's rank correlation coefficient

(d) Coefficient of concurrent deviations.

C

Write the correct answers. Each question carries 1 mark.

Que. 27 **For finding the degree of agreement about beauty between two Judges in a Beauty Contest, we use**

(a) Scatter diagram

(b) Coefficient of rank correlation

(c) Coefficient of correlation

(d) Coefficient of concurrent deviation.

b

Write the correct answers. Each question carries 1 mark.

Que. 28 If there is a perfect disagreement between the marks in Geography and Statistics, then what would be the value of rank correlation coefficient?

(a) Any value

(b) Only 1

(c) Only -1

(d) (b) or (c)

C

Write the correct answers. Each question carries 1 mark.

Que. 29 **When we are not concerned with the magnitude of the two variables under discussion, we consider**

(a) Rank correlation coefficient

(b) Product moment correlation coefficient

(c) Coefficient of concurrent deviation

(d) (a) or (b) but not (c).

C

Write the correct answers. Each question carries 1 mark.

Que. 30 What is the quickest method to find correlation between two variables?

(a) Scatter diagram

(b) Method of concurrent deviation

(c) Method of rank correlation

(d) Method of product moment correlation

b

Write the correct answers. Each question carries 1 mark.

Que. 33 **Since Blood Pressure of a person depends on age, we need to consider**

(a) The regression equation of Blood Pressure on age

(b) The regression equation of age on Blood Pressure

(c) Both (a) and (b)

(d) Either (a) or (b).

a

Write the correct answers. Each question carries 1 mark.

Que. 34 The method applied for deriving the regression equations is known as

(a) Least squares

(b) Concurrent deviation

(c) Product moment

(d) Normal equation.

a

Write the correct answers. Each question carries 1 mark.

Que. 35 **The difference between the observed value and the estimated value in regression analysis is known as**

(a) Error

(b) Residue

(c) Deviation

(d) (a) or (b).

d

Write the correct answers. Each question carries 1 mark.

Que. 36 The errors in case of regression equations are

(a) Positive

(b) Negative

(c) Zero

(d) All these.

d

Write the correct answers. Each question carries 1 mark.

Que. 37 The regression line of y on x is derived by

(a) The minimisation of vertical distances in the scatter diagram

(b) The minimisation of horizontal distances in the scatter diagram

(c) Both (a) and (b)

(d) (a) or (b).

a

Write the correct answers. Each question carries 1 mark.

Que. 38 **The two lines of regression become identical when**

(a) $r = 1$

(b) $r = -1$

(c) $r = 0$

(d) (a) or (b).

d

Write the correct answers. Each question carries 1 mark.

Que. 39 What are the limits of the two regression coefficients?

(a) No limit

(b) Must be positive

(c) One positive and the other negative

(d) Product of the regression coefficient must be numerically less than unity.

d

Write the correct answers. Each question carries 1 mark.

Que. 40 **The regression coefficients remain unchanged due to a**

(a) Shift of origin

(b) Shift of scale

(c) Both (a) and (b)

(d) (a) or (b).

a

Write the correct answers. Each question carries 1 mark.

Que. 41 **If the coefficient of correlation between two variables is –0.9, then the coefficient of determination is**

(a) 0.9

(b) 0.81

(c) 0.1

(d) 0.19.

b

Write the correct answers. Each question carries 1 mark.

Que. 42 **If the coefficient of correlation between two variables is 0.7 then the percentage of variation unaccounted for is**

(a) 70%

(b) 30%

(c) 51%

(d) 49%

C

BINOMIAL DISTRIBUTION

- It is derived from a particular type of random experiment known as Bernoulli process named after the famous mathematician

CHARACTERISTICS OF BERNOULLI TRIALS

i. Each trial is associated with two mutually exclusive and exhaustive outcomes (one is 'success' and other is 'failure')

ii. The trials are independent.

iii. The probability of a success (p) and failure,(q = 1–p), remain unchanged throughout the process.

iv. The number of trials is a finite positive integer.

BINOMIAL DISTRIBUTION

(bi - parametric
discrete probability distribution)

- A discrete random variable X is defined to follow binomial distribution with parameters n and p,

$$X \sim B(n, p),$$

Probability Mass Function

$$f(x) = p(X = x) = {}^{n}c_{x}\, p^{x} q^{n-x} \quad \text{for } x = 0, 1, 2, \ldots, n$$

BINOMIAL DISTRIBUTION

(bi - parametric discrete probability distribution)

Mean

$$\mu = n\,p$$

Variance

- The variance of the binomial distribution is given by

$$\sigma^2 = n\,p\,q$$

Variance of a binomial variable is always less than its mean.

Variance of X attains its maximum value at $p = q = 0.5$ and this maximum value is $n/4$.

BINOMIAL DISTRIBUTION

MODE

$(n+1)p$

INTEGER

- $\mu_0 = (n+1)p$
- $\mu_0 = (n+1)p - 1$

Bi - Modal

NON - INTEGER

μ_0 = the largest integer contained in $(n+1)p$

Uni- Modal

POISSON DISTRIBUTION

(UNI- parametric discrete probability distribution)

- Poisson distribution is applied when the total number of events is pretty large but the probability of occurrence is very small.

- A discrete random variable X that follows Poisson Distribution denoted as

$$X \sim P(m)$$

POISSON DISTRIBUTION

- A discrete random variable X that follows Poisson Distribution denoted as

$$X \sim P\,(m)$$

Probability Mass Function

$$f\,(x) = P\,(X = x) = \frac{e^{-m}\,.\,m^{x}}{x!} \text{ for } x = 0, 1, 2, \ldots\ \infty$$

where ,

$e = 2.71828$

$m = n\,p$

POISSON DISTRIBUTION

Mean

- The mean of Poisson distribution is given by

$$\mu = m$$

Variance

- The variance of Poisson distribution is given by

$$\sigma^2 = m$$

Standard Deviation

$$\sqrt{m}$$

POISSON DISTRIBUTION

MODE

m

INTEGER	NON – INTEGER
• $\mu_0 = m$ • $\mu_0 = m - 1$	μ_0 = the largest integer contained in m
Bi - Modal	Uni- Modal

Poisson Model

- **Let us think of a random experiment under the following conditions:**

I. **The probability of finding success in a very small time interval (t, t + dt) is kt, where k (>0) is a constant.**

II. **The probability of having more than one success in this time interval is very low.**

III. **The probability of having success in this time interval is independent of t as well as earlier successes.**

NORMAL DISTRIBUTION

(BI - parametric
CONTINUOUS probability distribution)

- A **continuous random variable x** is defined to follow normal distribution with parameters μ and σ^2, to be denoted by

$$X \sim N\,(\mu, \sigma^2)$$

NORMAL DISTRIBUTION

(BI - parametric CONTINUOUS probability distribution)

Probability Density Function

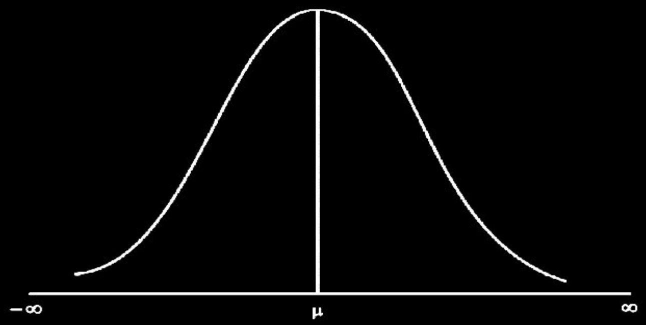
$$f(x) = \frac{1}{\sigma\sqrt{2\pi}} . e^{-(\bar{x}-u)^2/2\sigma^2}$$

for $-\infty < x < \infty$.

- e = 2.71828
- X = random variable
- **μ = mean of normal random variable x**
- **σ = standard deviation of the given normal distribution**

NORMAL CURVE

- The normal curve is **bell shaped .**
- The line drawn through x = μ has divided the normal curve **into two parts** which are equal in all respect.
- Normal distribution is **symmetrical** about x = μ. As such, **its skewness is zero**
- The two tails of the normal curve extend indefinitely on both sides of the curve and **both the left and right tails never touch the horizontal axis.**
- The **total area of the normal curve** or for that any probability curve is taken to be **unity i.e. one.**



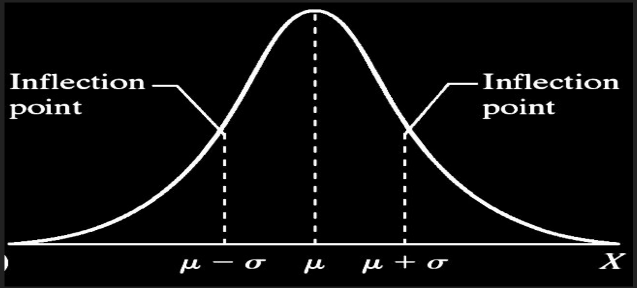
Normal curve /probability curve,

The area under this curve gives us the probability .

The area between −∞ to μ = the area between to μ to ∞ = 0.5

NORMAL DISTRIBUTION

MEAN = MEDIAN = MODE = μ (Symmetric distribution)

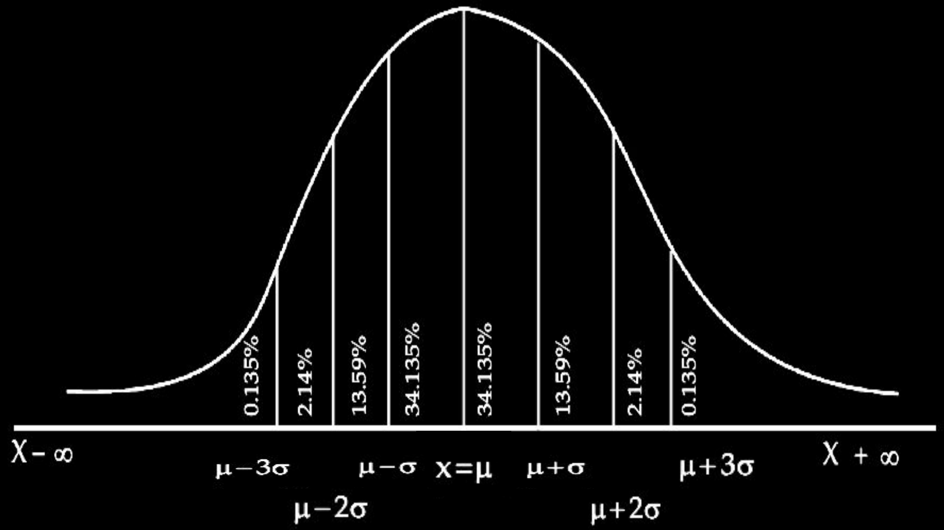


Two points of inflexion

- $\mu - \sigma$ and $\mu + \sigma$

VARIANCE	σ^2 (given in question)
Standard deviation	σ
Mean deviation	$0.8\ \sigma$
Quartile Deviation	$0.675\ \sigma$
Quartiles	$Q_1 = \mu - 0.675\sigma$ $Q_3 = \mu + 0.675\sigma$

NORMAL CURVE



$$P(\mu - \sigma < x < \mu + \sigma) = 0.6828$$

$$P(\mu - 2\sigma < x < \mu + 2\sigma) = 0.9546$$

$$P(\mu - 3\sigma < x < \mu + 3\sigma) = 0.9973$$

NORMAL CURVE

- If x and y are independent normal variables with means and standard deviations as μ_1 and μ_2 and σ_1 and σ_2, respectively, then $z = x + y$ also follows normal distribution with

  $SD = \sqrt{\sigma_1^2 + \sigma_2^2}$ respectively.

- mean $(\mu_1 + \mu_2)$ and

STANDARD NORMAL DISTRIBUTION

- If we take $\mu = 0$ and $\sigma = 1$

$$f(x) = \frac{1}{\sqrt{2\pi}} e^{-z^2/2} \qquad \text{for } -\infty < z < \infty$$

- The random variable z is known as standard normal variate (or variable) or standard normal deviate.

- It is given by $z = \frac{x - \mu}{\sigma}$

IMPORTANT RESULTS of STANDARD NORMAL DISTRIBUTION

- Mean = Median = Mode= 0
- The standard normal distribution is symmetrical about $z = 0$
- Variance = 1
- Standard deviation = 1
- Point of Inflexion = -1 and 1
- Mean deviation = 0.8
- Quartile deviation = 0.675

Cumulative Distribution Function

$P(z \leq k) = \phi(k)$

$$P(x < a) = P\left[\frac{x-\mu}{\sigma} < \frac{a-\mu}{\sigma}\right]$$

$$= P(z < k), (k = a - \mu/\sigma)$$

$$= \phi(k) \ldots\ldots\ldots\ldots\ldots\ldots\ldots (16.27)$$

Also $P(x \leq a) = P(x < a)$ as x is continuous.

$\phi(-k) = 1 - \phi(k)$

$$P(x > b) = 1 - P(x \leq b)$$

$$= 1 - \phi(b - \mu/\sigma) \ldots\ldots\ldots\ldots (16.28)$$

$$P(a < x < b) = \phi(b - \mu/\sigma) - \phi(a - \mu/\sigma)$$

- $\phi(k)$ gives the area from $-\infty$ to the point K
- Z table gives us the probability of values z = 0 to any value of z

BINOMIAL DISTRIBUTION

(bi - parametric
discrete probability distribution)

?

Applications of Binomial Distribution

Binomial distribution is applicable when the trials are independent and each trial has just two outcomes success and failure. It is applied in coin tossing experiments, sampling inspection plan, genetic experiments and so on.

POISSON DISTRIBUTION

(UNI- parametric
discrete probability distribution)

?

Application of Poisson distribution

Poisson distribution is applied when the total number of events is pretty large but the probability of occurrence is very small. Thus we can apply Poisson distribution, rather profitably, for the following cases:

a) The distribution of the no. of printing mistakes per page of a large book.

b) The distribution of the no. of road accidents on a busy road per minute.

c) The distribution of the no. of radio-active elements per minute in a fusion process.

d) The distribution of the no. of demands per minute for health centre and so on.

NORMAL DISTRIBUTION

(BI - parametric
CONTINUOUS probability distribution)

?

Applications of Normal Distribution

The applications of normal distribution is not restricted to statistics only. Many science subjects, social science subjects, management, commerce etc. find many applications of normal distributions. Most of the continuous variables like height, weight, wage, profit etc. follow normal distribution. If the variable under study does not follow normal distribution, a simple transformation of the variable, in many a case, would lead to the normal distribution of the changed variable. When n, the number of trials of a binomial distribution, is large and p, the probability of a success, is moderate i.e. neither too large nor too small then the binomial distribution, also, tends to normal distribution. Poisson distribution, also for large value of m approaches normal distribution. Such transformations become necessary as it is easier to compute probabilities under the assumption of a normal distribution. Not only the distribution of discrete random variable, the probability distributions of t, chi-square and F also tend to normal distribution under certain specific conditions. In order to infer about the unknown universe, we take recourse to sampling and inferences regarding the universe is made possible only on the basis of normality assumption. Also the distributions of many a sample statistic approach normal distribution for large sample size.

Write down the correct answers. Each question carries 1 mark.

Que. 1 A theoretical probability distribution.

(a) does not exist.

(b) exists in theory.

(c) exists in real life.

(d) both (b) and (c).

d

Write down the correct answers. Each question carries 1 mark.

Que. 2 **Probability distribution may be**

(a) discrete.

(b) continuous.

(c) infinite.

(d) (a) or (b).

d

Write down the correct answers. Each question carries 1 mark.

Que. 3 An important discrete probability distribution is

(a) Poisson distribution.

(b) Normal distribution.

(c) Cauchy distribution.

(d) Log normal distribution.

a

Write down the correct answers. Each question carries 1 mark.

Que. 4 **An important continuous probability distribution**

(a) Binomial distribution.

(b) Poisson distribution.

(c) Geometric distribution.

(d) Normal distribution.

d

Write down the correct answers. Each question carries 1 mark.

Que. 5 Parameter is a characteristic of

(a) population.

(b) sample.

(c) probability distribution.

(d) both (a) and (b).

a

Write down the correct answers. Each question carries 1 mark.

Que. 6 An example of a parameter is

(a) sample mean.

(b) population mean.

(c) binomial distribution.

(d) sample size.

b

Write down the correct answers. Each question carries 1 mark.

Que. 7 A trial is an attempt to

(a) make something possible.

(b) make something impossible.

(c) prosecute an offender in a court of law.

(d) produce an outcome which is neither certain nor impossible.

d

Write down the correct answers. Each question carries 1 mark.

Que. 8 The important characteristic(s) of Bernoulli trials

(a) each trial is associated with just two possible outcomes.

(b) trials are independent.

(c) trials are infinite.

(d) both (a) and (b).

d

Write down the correct answers. Each question carries 1 mark.

Que. 9 The probability mass function of binomial distribution is given by

(a) $f(x) = p^x q^{n-x}$.

(b) $f(x) = {}^n c_x p^x q^{\,n-x}$.

(c) $f(x) = {}^n c_x q^x q^{\,n-x}$..

(d) $f(x) = {}^n c_x p^{n-x} q^x$.

b

Write down the correct answers. Each question carries 1 mark.

Que. 10 If x is a binomial variable with parameters n and p, then x can assume

(a) any value between 0 and n.

(b) any value between 0 and n, both inclusive.

(c) any whole number between 0 and n, both inclusive.

(d) any number between 0 and infinity.

C

Write down the correct answers. Each question carries 1 mark.

Que. 11 A binomial distribution is

(a) never symmetrical.

(b) never positively skewed.

(c) never negatively skewed.

(d) symmetrical when $p = 0.5$.

d

Write down the correct answers. Each question carries 1 mark.

Que. 12 **The mean of a binomial distribution with parameter n and p is**

(a) n (1– p).

(b) np (1 – p).

(c) np.

(d) $\sqrt{np(1-p)}$.

C

Write down the correct answers. Each question carries 1 mark.

Que. 13 **The Variance of a binomial distribution with parameter n and p is**

(a) $np^2(1 - p)$.

(b) $\sqrt{np(1-p)}$.

(c) $nq(1 - q)$.

(d) $np^2pp^2(1- p)p^2$

C

Write down the correct answers. Each question carries 1 mark.

Que. 14 **An example of a bi-parametric discrete probability distribution is**

(a) binomial distribution.

(b) poisson distribution.

(c) normal distribution.

(d) both (a) and (b).

a

Write down the correct answers. Each question carries 1 mark.

Que. 15 For a binomial distribution, mean and mode

(a) are never equal.

(b) are always equal.

(c) are equal when q = 0.50.

(d) do not always exist.

C

Write down the correct answers. Each question carries 1 mark.

Que. 16 The mean of binomial distribution is

(a) always more than its variance.

(b) always equal to its variance.

(c) always less than its variance.

(d) always equal to its standard deviation.

a

Write down the correct answers. Each question carries 1 mark.

Que. 18 **The maximum value of the variance of a binomial distribution with parameters n and p is**

(a) n/2.

(b) n/4.

(c) np (1 – p).

(d) 2n.

b

Write down the correct answers. Each question carries 1 mark.

Que. 19 The method usually applied for fitting a binomial distribution is known as

(a) method of least square.

(b) method of moments.

(c) method of probability distribution.

(d) method of deviations.

b

Write down the correct answers. Each question carries 1 mark.

Que. 20 **Which one is not a condition of Poisson model?**

(a) the probability of having success in a small time interval is constant.

(b) the probability of having success more than one in a small time interval is very small.

(c) the probability of having success in a small interval is independent of time and also of earlier success.

(d) the probability of having success in a small time interval $(t, t + dt)$ is kt for a positive constant k.

a

Write down the correct answers. Each question carries 1 mark.

Que. 21 Which one is uniparametric distribution?

(a) Binomial.

(b) Poisson.

(c) Normal.

(d) Hyper geometric.

b

Write down the correct answers. Each question carries 1 mark.

Que. 22 For a Poisson distribution,

(a) mean and standard deviation are equal.

(b) mean and variance are equal.

(c) standard deviation and variance are equal.

(d) both (a) and (b).

b

Write down the correct answers. Each question carries 1 mark.

Que. 24 Poisson distribution is

(a) always symmetric.

(b) always positively skewed.

(c) always negatively skewed.

(d) symmetric only when m = 2.

b

Write down the correct answers. Each question carries 1 mark.

Que. 25 A binomial distribution with parameters n and p can be approximated by a Poisson distribution with parameter m = np is

(a) $n \to \infty$

(b) $p \to 0$.

(c) $n \to \infty$ and $p \to 0$.

(d) $n \to \infty$ and $p \to 0$ so that np remains finite..

d

Write down the correct answers. Each question carries 1 mark.

Que. 26 **For Poisson fitting to an observed frequency distribution,**

(a) we equate the Poisson parameter to the mean of the frequency distribution.

(b) we equate the Poisson parameter to the median of the distribution.

(c) we equate the Poisson parameter to the mode of the distribution.

(d) none of these.

a

Write down the correct answers. Each question carries 1 mark.

Que. 27 The most important continuous probability distribution is known as

(a) Binomial distribution.

(b) Normal distribution.

(c) Chi-square distribution.

(d) Sampling distribution.

b

Write down the correct answers. Each question carries 1 mark.

Que. 28 The probability density function of a normal variable x is given by

(a) $f(x) = \frac{1}{\sigma\sqrt{2\pi}} . e^{-\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)^2}$ for $-\infty < x < \infty$.

(b) $f(x) = \frac{1}{\sigma\sqrt{2\pi}} . e^{-\frac{-(x-\mu)^2}{2\sigma^2}}$ for $0 < x < \infty$.

(c) $f(x) = \frac{1}{\sqrt{2\pi\sigma}} . e^{-\frac{(x-\mu)^2}{2\sigma^2}}$ for $-\infty < x < \infty$.

(d) none of these.

a

Write down the correct answers. Each question carries 1 mark.

Que. 29 The total area of the normal curve is

(a) one.

(b) 50 per cent.

(c) 0.50.

(d) any value between 0 and 1.

a

Write down the correct answers. Each question carries 1 mark.

Que. 30 The normal curve is

(a) Bell-shaped.

(b) U- shaped.

(c) J-shaped.

(d) Inverted J-shaped.

a

Write down the correct answers. Each question carries 1 mark.

Que. 31 The normal curve is

(a) positively skewed.

(b) negatively skewed.

(c) symmetrical.

(d) all these.

C

Write down the correct answers. Each question carries 1 mark.

Que. 32 Area of the normal curve

(a) between $-\propto$ to μ is 0.50.

(b) between μ to $\propto$ is 0.50.

(c) between $-\propto$ to $\propto$ is 0.50.

(d) both (a) and (b).

d

Write down the correct answers. Each question carries 1 mark.

Que. 34 **The mean and mode of a normal distribution**

(a) may be equal.

(b) may be different.

(c) are always equal.

(d) (a) or (b).

C

Write down the correct answers. Each question carries 1 mark.

Que. 35 **The mean deviation about median of a standard normal variate is**

(a) 0.675 σ.

(b) 0.675.

(c) 0.80 σ .

(d) 0.80.

d

Write down the correct answers. Each question carries 1 mark.

Que. 36 **The quartile deviation of a normal distribution with mean 10 and SD 4 is**

(a) 0.675.

(b) 67.50.

(c) 2.70.

(d) 3.20.

C

Write down the correct answers. Each question carries 1 mark.

Que. 37 **For a standard normal distribution, the points of inflexion are given by**

(a) $\mu - \sigma$ and $\mu + \sigma$.

(b) $-\sigma$ and σ.

(c) –1 and 1.

(d) 0 and 1.

C

Write down the correct answers. Each question carries 1 mark.

Que. 38 The symbol $\Phi(a)$ indicates the area of the standard normal curve between

(a) 0 to a.

(b) a to ∞.

(c) – ∝ to a.

(d) – ∝ to ∝.

C

Write down the correct answers. Each question carries 1 mark.

Que. 39 The interval $(\mu - 3\sigma, \mu + 3\sigma)$ covers

(a) 95% area of a normal distribution.

(b) 96% area of a normal distribution.

(c) 99% area of a normal distribution.

(d) all but 0.27% area of a normal distribution.

d

Write down the correct answers. Each question carries 1 mark.

Que. 40 Number of misprints per page of a thick book follows

(a) Normal distribution.

(b) Poisson distribution.

(c) Binomial distribution.

(d) Standard normal distribution.

b

Write down the correct answers. Each question carries 1 mark.

Que. 41 The results of ODI matches between India and Pakistan follows

(a) Binomial distribution.

(b) Poisson distribution.

(c) Normal distribution.

(d) (b) or (c).

a

Write down the correct answers. Each question carries 1 mark.

Que. 42 The wage of workers of a factory follow

(a) Binomial distribution.

(b) Poisson distribution.

(c) Normal distribution.

(d) Chi-square distribution.

C

Write down the correct answers. Each question carries 1 mark.

Que. 43 If X and Y are two independent normal random variables, then the distribution of (X+Y) is

(a) normal.

(b) standard normal.

(c) T.

(d) chi-square.

a

DIVISIONS OF PROBABILITY

SUBJECTIVE PROBABILITY

OBJECTIVE PROBABILITY

COMPOSITE / COMPOUND EVENT

Event that can be subdivided into further events

$$P(A) = \frac{\text{Number of favourable outcomes}}{\text{Total number of possible outcomes}}$$

The probability of an event lies between 0 and 1, both inclusive.

i.e. $0 \leq P(A) \leq 1$

SURE EVENT

- If probability of occurrence of an event is 1

IMPOSSIBLE EVENT

- If probability of occurrence of an event is 0

$$P(A) + P(A') = 1$$

If more than one object is to be selected

Use combination to calculate favourable outcome and total outcome

ODDS IN FAVOUR

Odds in favour of an event A

$$= \frac{\text{no of favorable events to A}}{\text{no of unfavorable events to A}}$$

ODDS AGAINST AN EVENT

Odds against an event A

$$= \frac{\text{no of unfavourable events to A}}{\text{no of favourable events to A}}$$

PROBABILITY OF AN EVENT

$$P(A) = \frac{\text{no of favourable events to A}}{\text{no of favourable + no of unfavourable}}$$

- $P(A \cup B) = P(A) + P(B) - P(A \cap B)$
- If A and B are mutually exclusive

$$P(A \cup B) = P(A) + P(B)$$

- If A and B are mutually exclusive then $A \cap B = \Phi$

$$P(A \cup B \cup C) = P(A) + P(B) + P(C) - P(A \cap B) - P(A \cap C) - P(B \cap C) + P(A \cap B \cap C)$$

- If A ,B and C are mutually exclusive

$$P(A \cup B \cup C) = P(A) + P(B) + P(C)$$

- Two events A and B are exhaustive if

$$P(A \cup B) = 1$$

- Three events A, B and C are exhaustive if

$$P(A \cup B \cup C) = 1$$

- Events whose union is equal to sample space

- Three events A, B and C are equally likely if

$$P(A) = P(B) = P(C)$$

- If A, B and C are mutually exclusive and exhaustive events,

then , $P(A) + P(B) + P(C) = 1$

RESULT

- **Probability that only event A occurs**

$$P(A-B) = P(A \cap B') = P(A) - P(A \cap B)$$

- **Probability that only event B occurs**

$$P(B-A) = P(B \cap A') = P(B) - P(A \cap B)$$

COMPOUND PROBABILITY / JOINT PROBABILITY

WITHOUT REPLACEMENT

(DEPENDENT EVENT)

$$P(A \cap B) = P(A) \cdot P(B \mid A)$$

WITH REPLACEMENT

(INDEPENDENT EVENT)

$$P(A \cap B) = P(A) \cdot P(B)$$

It is used when we have to find simultaneous occurrence of two or more events

CONDITIONAL PROBABILITY

Event for which we are finding Conditional Probability

$$P(A/B) = \frac{P(A \cap B)}{P(B)}$$

Event which is occured

RANDOM VARIABLE

If a coin is tossed three times

S = {HHH, HHT, HTH, HTT, THH, THT, TTH, TTT}

X denotes the number of heads , then X is a random variable variable.

X = { 0 , 1, 2 ,3 }

PROBABILITY DISTRIBUTION

X	0	1	2	3
P	1/8	3/8	3/8	1/8

(i) $p_i \geq 0$ for every i

(ii) $\Sigma p_i = 1$ (over all i)

RANDOM VARIABLE / PROBABILITY DISTRIBUTION

X	0	1	2	3
P	1/8	3/8	3/8	1/8

Expected Value $\mu = E(x) = \sum p_i x_i$

$$E(X) = 0 \times 1/8 + 1 \times 3/8 + 2 \times 3/8 + 3 \times 1/8$$
$$= 12/8$$
$$= 1.5$$

RANDOM VARIABLE / PROBABILITY DISTRIBUTION

X	0	1	2	3
P	1/8	3/8	3/8	1/8

Variance of x, to be denoted by , σ^2 is given by

$$V(x) = \sigma^2 = E(x-\mu)^2$$

$$= E(x^2) - \mu^2$$

$E(X^2) = \frac{1}{8} \times 0^2 + \frac{3}{8} \times 1^2 + \frac{3}{8} \times 2^2 + \frac{1}{8} \times 3^2 = 3$

$E(x) = 1.5$

$v(x) = 0.75$

SD $= \sqrt{0.75}$

PROPERTIES OF EXPECTED VALUES

1. Expectation of a constant k is k

   i.e. $E(k) = k$ for any constant k. ....(15.51)

2. Expectation of sum of two random variables is the sum of their expectations.

   i.e. $E(x + y) = E(x) + E(y)$ for any two random variables x and y. .... (15.52)

3. Expectation of the product of a constant and a random variable is the product of the constant and the expectation of the random variable.

   i.e. $E(k\,x) = k.E(x)$ for any constant k .... (15.53)

4. Expectation of the product of two random variables is the product of the expectation of the two random variables, provided the two variables are independent.

   i.e. $E(xy) = E(x) \times E(y)$ .... (15.54)

   Whenever x and y are independent.

COINS

- Total number of elements in sample space while tossing a coin is given by 2^n

1. If a coin is tossed once $2^1 = 2$

   {H, T}

1. If two coins are tossed once or one coin tossed twice $2^2 = 4$

   {HH, HT, TH, TT}

1. If three coins are tossed once or one coin is tossed thrice $2^3 = 8$

   {HHH, HHT, HTH, THH, TTT, TTH, THT, HTT}

DICE

- Total number of elements in sample space while tossing a dice is given by 6^n

1. If a dice is rolled once $6^1 = 6$

   {1, 2, 3, 4, 5, 6}

DICE

2. If two die is rolled once or one dice is rolled twice

$6^2 = 36$

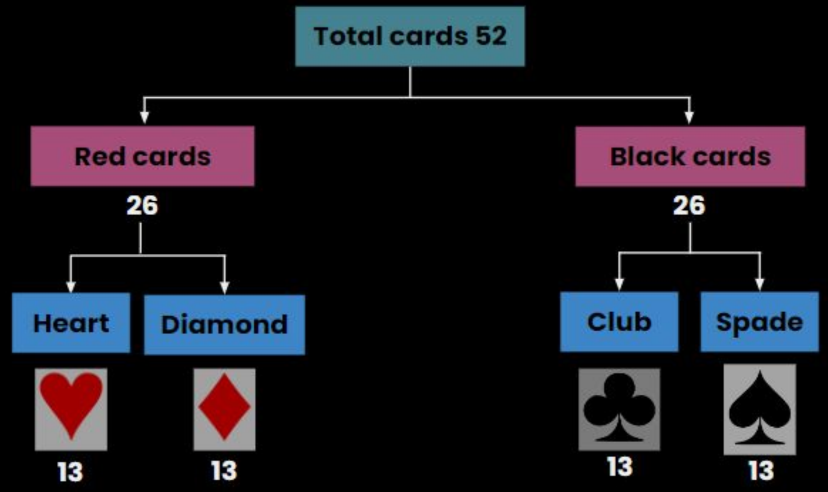
	1	2	3	4	5	6
1	(1, 1)	(1, 2)	(1, 3)	(1, 4)	(1, 5)	(1, 6)
2	(2, 1)	(2, 2)	(2, 3)	(2, 4)	(2, 5)	(2, 6)
3	(3, 1)	(3, 2)	(3, 3)	(3, 4)	(3, 5)	(3, 6)
4	(4, 1)	(4, 2)	(4, 3)	(4, 4)	(4, 5)	(4, 6)
5	(5, 1)	(5, 2)	(5, 3)	(5, 4)	(5, 5)	(5, 6)
6	(6, 1)	(6, 2)	(6, 3)	(6, 4)	(6, 5)	(6, 6)

DICE

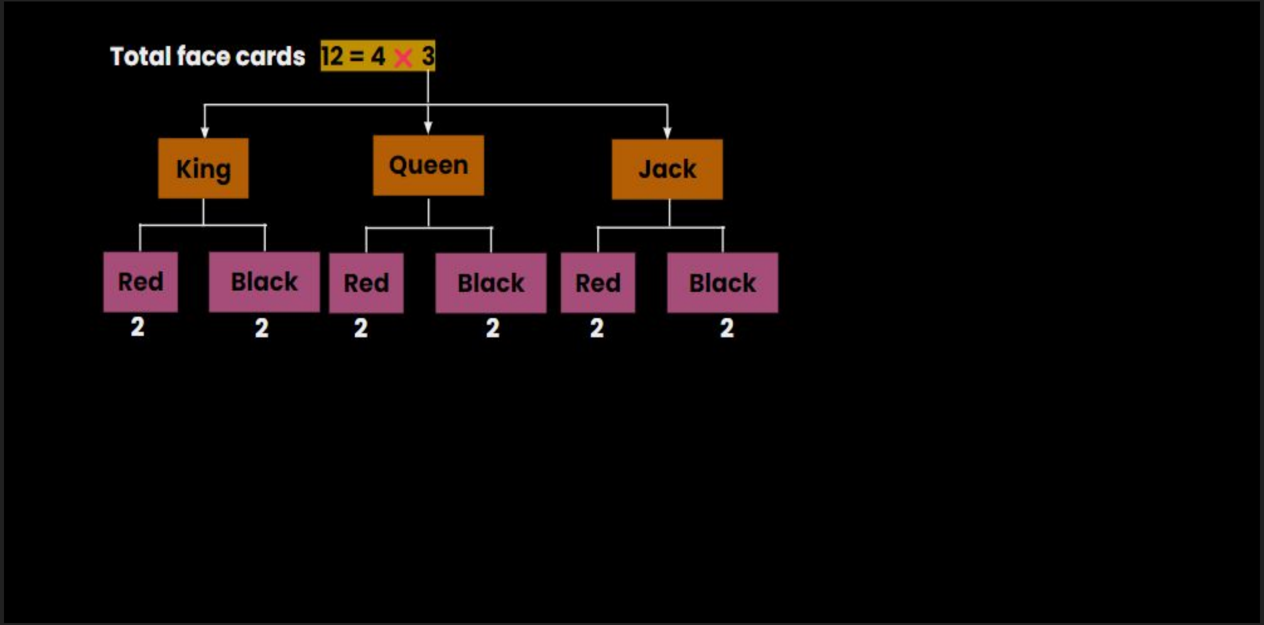
3. If three dice are rolled once or one dice is rolled thrice

$6^3 = 216$

CARDS


Total cards 52
Red cards
26
Black cards
26
Heart
Diamond
Club
Spade
13
13
13
13

CARDS


Total face cards
12 = 4 × 3
King
Queen
Jack
Red
Black
Red
Black
Red
Black
2
2
2
2
2
2


K


Q


J

Write down the correct answer. Each question carries 1 mark.

Que. 1 Initially, probability was a branch of

(a) Physics

(b) Statistics

(c) Mathematics

(d) Economics

C

Write down the correct answer. Each question carries 1 mark.

Que. 2 Two broad divisions of probability are

(a) Subjective probability and objective probability

(b) Deductive probability and non–deductive probability

(c) Statistical probability and Mathematical probability

(d) None of these

a

Write down the correct answer. Each question carries 1 mark.

Que. 3 Subjective probability may be used in

(a) Mathematics

(b) Statistics

(c) Management

(d) Accountancy

C

Write down the correct answer. Each question carries 1 mark.

Que. 5 An event that can be split into further events is known as

(a) Complex event

(b) Mixed event

(c) Simple event

(d) Composite event

d

Write down the correct answer. Each question carries 1 mark.

Que. 6 Which of the following pairs of events are mutually exclusive?

(a) A : The student reads in a school. B : He studies Philosophy.

(b) A : Raju was born in India. B : He is a fine Engineer.

(c) A : Ruma is 16 years old. B : She is a good singer.

(d) A : Peter is under 15 years of age. B : Peter is a voter of Kolkata.

d

Write down the correct answer. Each question carries 1 mark.

Que. 7 If P(A) = P(B), then

(a) A and B are the same events

(b) A and B must be same events

(c) A and B may be different events

(d) A and B are mutually exclusive events.

C

Write down the correct answer. Each question carries 1 mark.

Que. 8 **If $P(A \cap B) = 0$, then the two events A and B are**

(a) Mutually exclusive

(b) Exhaustive

(c) Equally likely

(d) Independent.

a

Write down the correct answer. Each question carries 1 mark.

Que. 9 **If for two events A and B, $P(A \cup B) = 1$, then A and B are**

(a) Mutually exclusive events

(b) Equally likely events

(c) Exhaustive events

(d) Dependent events.

C

Write down the correct answer. Each question carries 1 mark.

Que. 10 If an unbiased coin is tossed once, then the two events Head and Tail are

(a) Mutually exclusive

(b) Exhaustive

(c) Equally likely

(d) All these (a), (b) and (c).

d

Write down the correct answer. Each question carries 1 mark.

Que. 11 If $P(A) = P(B)$, then the two events A and B are

(a) Independent

(b) Dependent

(c) Equally likely

(d) Both (a) and (c).

C

Write down the correct answer. Each question carries 1 mark.

Que. 12 If for two events A and B, $P(A \cap B) \neq P(A) \times P(B)$, then the two events A and B are

(a) Independent

(b) Dependent

(c) Not equally likely

(d) Not exhaustive.

b

Write down the correct answer. Each question carries 1 mark.

Que. 13 If $P(A/B) = P(A)$, then

(a) A is independent of B

(b) B is independent of A

(c) B is dependent of A

(d) Both (a) and (b).

d

Write down the correct answer. Each question carries 1 mark.

Que. 14 **If two events A and B are independent, then**

(a) A and the complement of B are independent

(b) B and the complement of A are independent

(c) Complements of A and B are independent

(d) All of these (a), (b) and (c).

d

Write down the correct answer. Each question carries 1 mark.

Que. 15 If two events A and B are independent, then

(a) They can be mutually exclusive

(b) They can not be mutually exclusive

(c) They can not be exhaustive

(d) Both (b) and (c).

b

Write down the correct answer. Each question carries 1 mark.

Que. 16 If two events A and B are mutually exclusive, then

(a) They are always independent

(b) They may be independent

(c) They can not be independent

(d) They can not be equally likely.

C

Write down the correct answer. Each question carries 1 mark.

Que. 17 If a coin is tossed twice, then the events 'occurrence of one head', 'occurrence of 2 heads' and 'occurrence of no head' are

(a) Independent

(b) Equally likely

(c) Not equally likely

(d) Both (a) and (b).

C

Write down the correct answer. Each question carries 1 mark.

Que. 18 **The probability of an event can assume any value between**

(a) – 1 and 1

(b) 0 and 1, including 0 and 1

(c) – 1 and 0

(d) none of these.

b

Write down the correct answer. Each question carries 1 mark.

Que. 19 If P(A) = 0, then the event A

(a) will never happen

(b) will always happen

(c) may happen

(d) may not happen.

a

Write down the correct answer. Each question carries 1 mark.

Que. 20 If $P(A) = 1$, then the event A is known as

(a) symmetric event

(b) dependent event

(c) improbable event

(d) sure event.

d

Write down the correct answer. Each question carries 1 mark.

Que. 21 If p : q are the odds in favour of an event, then the probability of that event is

(a) p/q

(b) p/(p + q)

(c) q/(p + q)

(d) none of these

b

Write down the correct answer. Each question carries 1 mark.

Que. 22 If $P(A) = 5/9$, then the odds against the event A is

(a) 5 : 9

(b) 5 : 4

(c) 4 : 5

(d) 5 : 14

C

Write down the correct answer. Each question carries 1 mark.

Que. 23 If A, B and C are mutually exclusive and exhaustive events, then $P(A) + P(B) + P(C)$ equals to

(a) 1/3

(b) 1

(c) 0

(d) any value between 0 and 1.

b

Write down the correct answer. Each question carries 1 mark.

Que. 24 If A denotes that a student reads in a school and B denotes that he plays cricket, then

(a) $P(A \cap B) = 1$

(b) $P(A \cup B) = 1$

(c) $P(A \cap B) = 0$

(d) $P(A) = P(B)$.

C

Write down the correct answer. Each question carries 1 mark.

Que. 25 P(B/A) is defined only when

(a) A is a sure event

(b) B is a sure event

(c) A is not an impossible event

(d) B is an impossible event.

C

Write down the correct answer. Each question carries 1 mark.

Que. 26 **$P(A/B')$ is defined only when**

(a) B is not a sure event

(b) B is a sure event

(c) B is an impossible event

(d) B is not an impossible event.

a

Write down the correct answer. Each question carries 1 mark.

Que. 27 For two events A and B, $P(A \cup B) = P(A) + P(B)$ only when

(a) A and B are equally likely events

(b) A and B are exhaustive events

(c) A and B are mutually independent

(d) A and B are mutually exclusive.

d

Write down the correct answer. Each question carries 1 mark.

Que. 28 **Addition Theorem of Probability states that for any two events A and B,**

(a) $P(A \cup B) = P(A) + P(B)$

(b) $P(A \cup B) = P(A) + P(B) + P(A \cap B)$

(c) $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

(d) $P(A \cup B) = P(A) \times P(B)$

C

Write down the correct answer. Each question carries 1 mark.

Que. 30 For any two events A and B,

(a) $P(A-B) = P(A) - P(B)$

(b) $P(A-B) = P(A) - P(A \cap B)$

(c) $P(A-B) = P(B) - P(A \cap B)$

(d) $P(B-A) = P(B) + P(A \cap B)$.

b

Write down the correct answer. Each question carries 1 mark.

Que. 31 **The limitations of the classical definition of probability**

(a) it is applicable when the total number of elementary events is finite

(b) it is applicable if the elementary events are equally likely

(c) it is applicable if the elementary events are mutually independent

(d) (a) and (b).

d

Write down the correct answer. Each question carries 1 mark.

Que. 32 According to the statistical definition of probability, the probability of an event A is the

(a) limiting value of the ratio of the no. of times the event A occurs to the number of times the experiment is repeated

(b) the ratio of the frequency of the occurrences of A to the total frequency

(c) the ratio of the frequency of the occurrences of A to the non-occurrence of A

(d) the ratio of the favourable elementary events to A to the total number of elementary events.

a

Write down the correct answer. Each question carries 1 mark.

Que. 33 **The Theorem of Compound Probability states that for any two events A and B.**

(a) $P(A \cap B) = P(A)\ P(B/A)$

(b) $P(A \cup B) = P(A) \times P(B/A)$

(c) $P(A \cap B) = P(A) \times P(B)$

(d) $P(A \cup B) = P(B) + P(B) - P(A \cap B)$.

a

Write down the correct answer. Each question carries 1 mark.

Que. 34 If A and B are mutually exclusive events, then

(a) $P(A) = P(A-B)$.

(b) $P(B) = P(A-B)$.

(c) $P(A) = P(A \cap B)$.

(d) $P(B) = P(A \cap B)$.

a

Write down the correct answer. Each question carries 1 mark.

Que. 35 If $P(A-B) = P(B-A)$, then the two events A and B satisfy the condition

(a) $P(A) = P(B)$.

(b) $P(A) + P(B) = 1$

(c) $P(A \cap B) = 0$

(d) $P(A \cup B) = 1$

a

Write down the correct answer. Each question carries 1 mark.

Que. 36 The number of conditions to be satisfied by three events A, B and C for complete independence is

(a) 2

(b) 3

(c) 4

(d) any number.

C

Write down the correct answer. Each question carries 1 mark.

Que. 37 If two events A and B are independent, then $P(A \cap B)$

(a) equals to $P(A) + P(B)$

(b) equals to $P(A) \times P(B)$

(c) equals to $P(A) \times P(B/A)$

(d) equals to $P(B) \times P(A/B)$.

b

Write down the correct answer. Each question carries 1 mark.

Que. 38 **Values of a random variable are**

(a) always positive numbers.

(b) always positive real numbers.

(c) real numbers.

(d) natural numbers.

C

Write down the correct answer. Each question carries 1 mark.

Que. 39 Expected value of a random variable

(a) is always positive

(b) may be positive or negative

(c) may be positive or negative or zero

(d) can never be zero.

C

Write down the correct answer. Each question carries 1 mark.

Que. 40 If all the values taken by a random variable are equal then

(a) its expected value is zero

(b) its standard deviation is zero

(c) its standard deviation is positive

(d) its standard deviation is a real number.

b

Write down the correct answer. Each question carries 1 mark.

Que. 41 If x and y are independent, then

(a) $E(xy) = E(x) \times E(y)$

(b) $E(xy) = E(x) + E(y)$

(c) $E(x - y) = E(x) + E(y)$

(d) $E(x - y) = E(x) + x\,E(y)$

a

Write down the correct answer. Each question carries 1 mark.

Que. 42 If a random variable x assumes the values x_1, x_2, x_3, x_4 with corresponding probabilities p_1, p_2, p_3, p_4 then the expected value of x is

(a) $p_1 + p_2 + p_3 + p_4$

(b) $x_1p_1 + x_2p_3 + x_3p_2 + x_4p_4$

(c) $p_1x_1 + p_2x_2 + p_3x_3 + p_4x_4$

(d) none of these.

C

Write down the correct answer. Each question carries 1 mark.

Que. 44 Variance of a random variable x is given by

(a) $E(X - \mu)^2$

(b) $E[X - E(X)]^2$

(c) $E(X^2 - \mu)$

(d) a and b

d

Write down the correct answer. Each question carries 1 mark.

Que. 45 If two random variables x and y are related by $y = 2 - 3x$, then the SD of y is given by

(a) $-3 \times$ SD of x

(b) $3 \times$ SD of x

(c) $9 \times$ SD of x

(d) $2 \times$ SD of x

b

Write down the correct answer. Each question carries 1 mark.

Que. 46 Probability of getting a head when two unbiased coins are tossed simultaneously is

(a) 0.25

(b) 0.50

(c) 0.20

(d) 0.75

b

Write down the correct answer. Each question carries 1 mark.

Que. 47 If an unbiased coin is tossed twice, the probability of obtaining at least one tail is

(a) 0.25

(b) 0.50

(c) 0.75

(d) 1.00

C

Write down the correct answer. Each question carries 1 mark.

Que. 48 **If an unbiased die is rolled once, the odds in favour of getting a point which is a multiple of 3 is**

(a) 1:2

(b) 2:1

(c) 1:3

(d) 3:1

a

Write down the correct answer. Each question carries 1 mark.

Que. 49 A bag contains 15 one rupee coins, 25 two rupee coins and 10 five rupee coins. If a coin is selected at random from the bag, then the probability of not selecting a one rupee coin is

(a) 0.30

(b) 0.70

(c) 0.25

(d) 0.20

b

Write down the correct answer. Each question carries 1 mark.

Que. 50 **A, B, C are three mutually independent with probabilities 0.3, 0.2 and 0.4 respectively. What is P $(A \cap B \cap C)$?**

(a) 0.400

(b) 0.240

(c) 0.024

(d) 0.500

C

Write down the correct answer. Each question carries 1 mark.

Que. 51 If two letters are taken at random from the word HOME, what is the Probability that none of the letters would be vowels?

(a) 1/6

(b) 1/2

(c) 1/3

(d) 1/4

a

Write down the correct answer. Each question carries 1 mark.

Que. 52 If a card is drawn at random from a pack of 52 cards, what is the chance of getting a Spade or an ace?

(a) 4/13

(b) 5/13

(c) 0.25

(d) 0.20

a

Write down the correct answer. Each question carries 1 mark.

Que. 53 If x and y are random variables having expected values as 4.5 and 2.5 respectively, then the expected value of $(x-y)$ is

(a) 2

(b) 7

(c) 6

(d) 0

a

Write down the correct answer. Each question carries 1 mark.

Que. 54 If variance of a random variable x is 23, then what is the variance of 2x + 10?

(a) 56

(b) 33

(c) 46

(d) 92

d

Write down the correct answer. Each question carries 1 mark.

Que. 55 What is the probability of having at least one ‘six’ from 3 throws of a perfect die?

(a) $5/6$

(b) $(5/6)^3$

(c) $1 - (1/6)^3$

(d) $1 - (5/6)^3$

d