Chapter

1

Scope of Statistics and Types of Data

Prsanta Chandra Mahalanobis
(29 June, 1893-28 June, 1972)

P C Mahalanobis, known as father of Indian Statistics, received his early schooling at the Brahmo Boys School and graduation in Physics in 1912 through Presidency college, Kolkata. He left for England in1913 for higher studies at University of London. Mahalanobis was introduced to the journal Biometrika, that motivated him for the interest in statistics. A statistical laboratory was developed by him at Presidency College and later this formed the foundation for the famous Indian Statistical Institute at Kolkata. One of his important contribution was in designing and conducting large scale surveys. He introduced the concept of pilot surveys and advocated the usefulness of sampling methods.

DO YOU KNOW?

June 29th the birth anniversary of **P.C. Mahalanobis** is commemorated as the National Statistics Day of India.

'Statistics is the grammar of science' *-Karl Pearson*

Learning Objectives

- Highlights the origin and growth of statistics
- Introduces the meaning and definitions of statistics
- Presents the scope and functions of statistics
- Explains the applications of statistics in different fields
- Introduces the meaning of data
- Distinguishes the different types of data

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Introduction

In this unit, we present the meaning of statistics, various definitions, origin and growth, functions, scope and applications to different fields such as Agriculture, Economics and many more. We also define 'data', various types of data and their measurement scales.

1.1 Origin and Growth of Statistics

The origin of statistics can be traced back to the primitive man, who put notches on trees to keep an account of his belongings. During 5000 BCE, kings used to carry out census of populations and resources of the state. Kings of olden days made their crucial decisions on wars, based on statistics of infantry, cavalry and elephantary units of their own and that of their enemies. Later it enhanced its scope in their kingdoms' tax management and administrative domains. Thus, the word 'Statistics' has its root either to Latin word 'Status' or Italian word 'Statista' or German word 'Statistik' each of which means a 'political state'. The word 'Statistics' was primarily associated with the presentation of facts and figures pertaining to demographic, social and political situations prevailing in a state/government. Its evolution over time formed the basis for most of the science and art disciplines. Statistics is used in the developmental phases of both theoretical and applied areas, encompassing the field of Industry, Agriculture, Medicine, Sports and Business analytics.

DO YOU KNOW?

The word 'data' was first used in 1640's. In 1946, the word 'data' also meant for "transmittable and storable computer information". In 1954, a term called 'data processing' was introduced. The plural form of 'datum' is 'data'. It also means "given" or "to give" in Latin.

In olden days statistics was used for political- war purpose. Later, it was extended to taxation purposes. This is evident from Kautilya's Arthasastra (324 – 300 BCE). Akbar`s finance minister Raja Thodarmall collected information regarding agricultural land holdings. During the seventeenth century, statistics entered in vital statistics, which is the basis for the modern day Actuarial Science. Gauss introduced the theory of errors in physical sciences at the end of eighteenth century.

Statistics is concerned with scientific method for collecting, organizing, summarizing, presenting, analyzing and interpreting of data. The word statistics is normally referred either as numerical facts or methods.

Statistics is used in two different forms-singular and plural. In plural form it refers to the numerical figures obtained by measurement or counting in a systematic manner with a definite purpose such as number of accidents in a busy road of a city in a day, number of people died due to a chronic disease during a month in a state and so on. In its singular form, it refers to statistical theories and methods of collecting, presenting, analyzing and interpreting numerical figures.

Though the importance of statistics was strongly felt, its tremendous growth was in the twentieth century. During this period, lot of new theories, applications in various disciplines were introduced. With the contribution of renowned statisticians several

theories and methods were introduced, naming a few are Probability Theory, Sampling Theory, Statistical Inference, Design of Experiments, Correlation and Regression Methods, Time Series and Forecasting Techniques.

In early 1900s, statistics and statisticians were not given much importance but over the years due to advancement of technology it had its wider scope and gained attention in all fields of science and management. We also tend to think statistician as a small profession but a steady growth in the last century is impressive. It is pertinent to note that the continued growth of statistics is closely associated with information technology. As a result several new inter- disciplines have emerged. They are Data Mining, Data Warehousing, Geographic Information System, Artificial Intelligence etc. Now-a-days, statistics can be applied in hardcore technological spheres such as Bioinformatics, Signal processing, Telecommunications, Engineering, Medicine, Crimes, Ecology, etc.

Today's business managers need to learn how analytics can help them make better decisions that can generate better business outcomes. They need to have an understanding of the statistical concepts that can help analyze and simplify the flood of data around them. They should be able to leverage analytical techniques like decision trees, regression analysis, clustering and association to improve business processes.

1.2 Definitions

Statistics has been defined by various statisticians.

- *'Statistics is the science of counting'* -***A. L .Bowley***
- *'Statistics is the science which deals with the collection, presentation, analysis and interpretation of numerical data'* - ***Croxton and Cowden***
- **Wallist** and **Roberts** defines statistics as *"Statistics is a body of methods for making decisions in the face of uncertainty"*
- **Ya-Lun-Chou** slightly modifies Wallist and Roberts definition and come with the following definition : *"Statistics is a method of decision making in the face of uncertainty on the basis of numerical data and calculated risk."*

It may be seen that most of the above definitions of statistics are restricted to numerical measurements of facts and figures of a state. But modern thinkers like Secrist defines statistics as

'By statistics we mean the aggregate of facts affected to a marked extent by multiplicity of causes, numerically expressed, enumerated or estimated to reasonable standards of accuracy collected in a systematic manner for a predetermined purpose and placed in relation to each other'.

Among them, the definition by Croxton and Cowden is considered as the most preferable one due to its comprehensiveness. It is clear from this definition that statistics brings out the following characteristics.

Characteristics of Statistics:

(1) Aggregate of facts collected in systematic manner for a specific purpose.

Statistics deals with the aggregate of facts and figures. A single number cannot be called as statistics. For example, the weight of a person with 65kg is not statistics but the weights of a class of 60 persons is statistics, since they can be studied together and meaningful comparisons are made in relation to the other. This reminds us of Joseph Stalin's well known quote, "One death is a tragedy; a million is a statistics." Further the purpose for which the data is collected is to be made clear, otherwise the whole exercise will be futile. The data so collected must be in a systematic way and should not be haphazard.

(2) Affected by large number of causes to marked extent.

Statistical data so collected should be affected by various factors at the same time. This will help the statistician to identify the factors that influence the statistics. For example, the sales of commodities in the market are affected by causes such as supply, demand, and import quality etc. Similarly, as mentioned earlier if a million deaths occur the policy makers will be immediately in action to find out the causes for these deaths to see that such events will not occur.

(3) Numerically expressed.

The statistical facts and figures are collected numerically for meaningful inference. For instance, the service provided by a telephone company may be classified as poor, average, good, very good and excellent. They are qualitative in nature and cannot be called statistics. They should be expressed numerically such as 0 to denote poor,1 for average, 2 for good, 4 to denote very good and 5 for excellent. Then this can be regarded as statistics and is suitable for analysis. The other types of quality characteristics such as honesty, beauty, intelligence, defective etc which cannot be measured numerically cannot be called statistics. They should be suitably expressed in the form of numbers so that they are called statistics.

(4) Enumerated or estimated with a reasonable degree of accuracy.

The numerical data are collected by counting, measuring or by estimating. For example, to find out the number of patients admitted in a hospital, data is collected by actual counting or to find out the obesity of patients, data are collected by actual measurements

on height and weight. In a large scale study like crop estimation, data are collected by estimation and using the powerful sampling techniques, because the actual counting may or may not be possible. Even if it is possible, the measurements involve more time and cost. The estimated figures may not be accurate and precise. However certain degree of accuracy has to be maintained for a meaningful analysis.

(5) To be placed in relation to the other.

One of the main reasons for the collection of statistical data is for comparisons In order to make meaningful and valid comparisons, the data should be on the same characteristic as far as possible. For instance, we can compare the monthly savings of male employees to that of the female employees in a company. It is meaningless if we compare the heights of 20 year-old boys to the heights 20 year- old trees in a forest.

Having looked into various definitions given by different authors to the term statistics in different contexts it would be appropriate to define

"Statistics in the sense of data are numerical statements of facts capable of analysis and interpretation".

"Statistics in the sense of science is the study of principles and methods used in the collection, presentation, analysis and interpretation of numerical data in any sphere of enquiry".

1.3 Functions of Statistics

The functions of statistics can be elegantly expressed as 7 - C's as :

S.NO	Functions	What it does
1	Collection	The basic ingredient of statistics is data. It should be carefully and scientifically collected
2	Classification	The collected data is grouped based on similarities so that large and complex data are in understandable form.
3	Condensation	The data is summarized, precisely without losing information to do further statistical analysis.
4	Comparison	It helps to identify the best one and checking for the homogeneity of groups,
5	Correlation	It enables to find the relationship among the variables
6	Causation.	To evaluate the impact of independent variables on the dependent variables.
7	Chance	Statistics helps make correct decisions under uncertainty.

1.4 Scope and Applications

In ancient times the scope of statistics was limited. When people hear the word 'Statistics' they think immediately of either sports related numbers or a subject they have studied at college and passed with minimum marks. While statistics can be thought in these terms there is a wide scope for statistics. Today, there is no human activity which does not use statistics. There are two major divisions of statistical methods called descriptive statistics and inferential statistics and each of the divisions are important and satisfies different objectives. The descriptive statistics is used to consolidate a large amount of information. For example, measures of central tendency, like mean are descriptive statistics. Descriptive statistics just describes the data in a condensed form for solving some limited problems. They do not involve beyond the data at hand.

Inferential statistics, on the other hand, are used when we want to draw meaningful conclusions based on sample data drawn from a large population. For example, one might want to test whether a recently developed drug is more efficient than the conventional drug. Hence, it is impossible to test the efficiency of the drug by administering to each patient affected by a particular disease, but we will test it only through a sample. A quality control engineer may be interested in the quality of the products manufactured by a company. He uses a powerful technique called acceptance sampling to protect the producer and consumer interests. An agricultural scientist wanted to test the efficacy of fertilizers should test by designed experiments. He may be interested in farm size, use of land and crop harvested etc. One advantage of working in statistics is that one can combine his interest with almost any field of science, technology or social sciences such as Economics Commerce, Engineering Medicine, and Criminology and so on.

The profession of statistician is exciting, challenging and rewarding. Statistician is the most prevalent title but professionals like Risk analyst, Data analyst, Business analyst have been engaged in work related to statistics. In view of the overwhelming demand for Statistics many universities in India and elsewhere have been offering courses in statistics at graduate and Master's level. We have mentioned earlier that statistics has applications to almost all fields. Here in this section we highlight its applications to select branches.

1.4.1 Statistics and actuarial science

Actuarial science is the discipline that extensively applies statistical methods among other subjects involved in insurance and financial institutions. The professionals who qualify in actuarial science course are called actuaries. Actuaries, in the earlier days used deterministic models to assess the premiums in insurance sector. Nowadays, with modern computers and sophisticated statistical methods, science has developed vastly. In India, from 2006 a statutory body has been looking after the profession of actuaries.

1.4.2 Statistics and Commerce

Statistical methods are widely used in business and trade solutions such as financial analysis, market research and manpower planning. Every business establishment irrespective of the type has to adopt statistical techniques for its growth. They estimate the trend of prices, buying and selling, importing and exporting of goods using statistical methods and past data. Ya-Lun-Chou says "It is not an exaggeration to say that today nearly every decision in business is made with the aid of statistical data and statistical methods."

Success Story

In 2004, a hurricane named *Sandy* hit the United States, tens of thousands of households were affected by it with bad weather and power failure. A Multi National Company, the largest retailer across the globe conducted a vast data analysis through its comprehensive database system and came out with surprising results. Emergency equipments and frozen bakery products were badly needed by the households during such disasters. This data analysis helped the MNC to predict the next hurricane named France in 2012. So it dispatched emergency equipments, flashlights and bakery products like strawberry pop tarts to all its retail outlets near the hurricane hit places. Those products were sold extremely well in large number by that particular MNC, whereas other retailers could not do. Such Big data analysis and prediction henceforth has helped many Multi National Companies to reduce their time, cost and labour.

1.4.3 Statistics and Economics

Statistical methods are very much useful to understand economic concepts, such as mandatory policy and public finance. In the modern world, economics is taught as an exact service which makes extensive use of statistics. Some of the important statistical techniques used in economic analysis are: Times series, Index Numbers, Estimation theory and Tests of significance, stochastic models. According to Engeberg "No Economist would attempt to arrive at a conclusion concerning the production or distribution of wealth without an exhaustive study of statistical data." In our country many state governments have a division called Department of Economics and Statistics for the analysis of Economic data of the state.

1.4.4 Statistics and Medicine

In medical field, statistical methods are extensively used. If we look at the medical journals one can understand to what extent the statistical techniques play a key role. Medical statistics deals with the applications of statistical methods like tests of significance and confidence intervals to medicine and health science including epidemiology, public health. Modern statistical methods helps the medical practitioners to understand how long a patient affected by a dreaded disease will survive and what are the factors that influence a patient to be alive or dead.

A Digital Revolution in Healthcare

- The Economist, Feb 03,2018

We know that the internet already enables patients to seek online consultations when and where it suits them. Now technologies such as the smartphones allow people to monitor their own health.

The possibilities multiply when you add to crucial missing ingredients- access to your own medical records and the ability, easily to share information with those you trust. That allows you to reduce inefficiencies in your own treatment and also to provide date to help train medical algorithms. You can enhance your own care and everyone else's too.

1.4.5 Statistics and Agriculture

Experimentation and inference based on these experiments are the key features of general scientific methodology. Agricultural scientists conduct experiments and make inferences to decide whether the particular variety of crop gives a better yield than others or a particular type of fertilizer etc,. There are several institutes where research is being done by making use of statistical methods like analysis of variance (ANOVA), factorial experiments etc., falls under the hut of Design of experiments. There is a separate institute (IASRI), New Delhi, carrying out research in agricultural statistics.

1.4.6 Statistics and Industry

Statistical methods play a vital role in any modern use of science and technology. Many statistical methods have been developed and applied in industries for various problems. For example, to maintain the quality of manufactured products the concept of statistical quality control is used. The quality in time domain study of mechanical, electrical or electronic items the concept of 'Reliability' has emerged. Total quality management and six-sigma theories make use of statistical concepts.

1.4.7 Statistics and Information Technology

Information Technology is the applications of computers and telecommunication equipments to store, retrieve, transmit and manipulate data. Now-a-days, several industries are involved in information technology and massive amounts of data are stored every day. These data are to be analyzed meaningfully so that the information contained in the data

is used by the respective users. To address this issue, fields such as data mining, Machine learning have emerged. Data mining an interdisciplinary sub field of computer science is the computational process of discovering patterns in large data sets involving methods such as artificial intelligence and statistics. Persons trained in statistics with computing knowledge have been working as data analytics to analyze such huge data.

1.4.8 Statistics and Government

Statistics provides statistical information to government to evolve policies, to maintain law and order, to promote welfare schemes and to other schemes of the government. In other words, statistical information is vital in overall governance of the state. For instance statistics provide information to the government on population, agricultural production, industrial production, wealth, imports, exports, crimes, birth rates, unemployment, education, minerals and so on.

1.5 Big Data

Big Data is a term used for a collection of data sets that are large and complex, which is difficult to store and process using available database management tools or traditional data processing applications. Daily we upload millions of bytes of data. 90 % of the world's data has been created in last few years.

Applications of Big Data

We cannot talk about data without talking about the people, because those are the once who are getting benefited by Big Data applications. Almost all the industries today are leveraging Big Data applications in one or the other way.

Smarter Healthcare: Making use of the petabytes of patient's data, the organization can extract meaningful information and then build applications that can predict the patient's deteriorating condition in advance.

Retail: Retail has some of the tightest margins, and is one of the greatest beneficiaries of big data. The beauty of using big data in retail is to understand consumer behavior. Suggestion based on the browsing history of the consumer, they supply their product to increase their sales.

Manufacturing: Analyzing big data in the manufacturing industry can reduce component defects, improve product quality, increase efficiency, and save time and money.

Traffic control: Traffic congestion is a major challenge for many cities globally. Effective use of data and sensors will be key to managing traffic better as cities become increasingly densely populated.

Search Quality: Every time we are extracting information from google, we are simultaneously generating data for it. Google stores this data and uses it to improve its search quality.

Sales promotion: Prominent sports persons or celebrities are selected as Brand Ambassadors for their products by the prominent industries through big data got from social media or from other organizations.

Challenges with Big Data

We have a few challenges which come along with Big Data those are data complexity, storage, discovery analytics and lack of talent. But we have several advance programming language that can handle the issue of Big data, like Hadoop, Mapreduce, Scale etc., and many of this languages like open source, Java-based programming framework that supports the storage and processing of extremely large data sets in a distributed computing environment.

1.6 Variable and Types of Data

Information, especially facts or numbers collected for decision making is called data. Data may be numerical or categorical. Data may also be generated through a variable.

Variable: A variable is an entity that varies from a place to place, a person to person, a trial to trial and so on. For instance the height is a variable; domicile is a variable since they vary from person to person.

A variable is said to be quantitative if it is measurable and can be expressed in specific units of measurement (numbers).

A variable is said to be qualitative if it is not measurable and cannot be expressed in specific units of measurement (numbers). This variable is also called categorical variable.

The variable height is a quantitative variable since it is measurable and is expressed in a number while the variable domicile is qualitative since it is not measured and is expressed as rural or urban. It is noted that they are free from units of measurement.

Quantitative Data:

Quantitative data (variable) are measurements that are collected or recorded as a number. Apart from the usual data like height, weight etc.,

Qualitative Data:

Qualitative data are measurements that cannot be measured on a natural numerical scale. For example, the blood types are categorized as O, A, B along with the Rh factors. They can only be classified into one of the pre assigned or pre designated categories.

1.7 Measurement Scales

There are four types of data or measurements scales called nominal, ordinal, interval and ratio. These measurement scale is made by Stanley Stevens.

1.7.1 Nominal scales:

Nominal measurement is used to label a variable without any ordered value. For example, we can ask in a questionnaire 'What is your gender? The answer is male or female. Here gender is a nominal variable and we associate a value 1 for male and 2 for a female.'

They are numerical for name sake only. For example, the numbers 1,2,3,4 may be used to denote a person being single, married, widowed or divorced respectively. These numbers do not share any of the properties of numbers we deal with in day to life. We cannot say $4 > 1$ or $2 < 3$ or $1+3 = 4$ etc. The order of listings in the categories is irrelevant here. Any statistical analysis carried out with the ordering or with arithmetic operations is meaningless.

1.7.2 Ordinal scales:

These data share some properties of numbers of arithmetic but not all properties. For example, we can classify the cars as small, medium and big depending on the size.

In the ordinal scales, the order of the values is important but the differences between each one is unknown. Look at the example below.

How did you feel yesterday after our trip toVedanthangal? The answers would be:

(1) Very unhappy (2) Unhappy (3) Okay (4) Happy (5) Very happy

In each case, we know that number 5 is better than number 4 or number 3, but we don't know how much better it is. For example, is the difference between "Okay" and "Unhappy" the same as the difference between "Very Happy" and "Happy?" In fact we cannot say anything.

NOTE

In the 'ordinal scales' it is the order that matters, and that is all we get from these. It is to be noted that the mean cannot be computed from the ordinal data, but either median or mode can be computed.

Similarly, a medical practitioner can say the condition of a patient in the hospital as good, fair, serious and critical and assign numbers 1 for good, 2 for fair, 3 for serious and 4 for critical. The level of seriousness can be from 1 to 4 leading to $1 < 2$ or $2 < 3$ or $3 < 4$. However, the value here just indicates the level of seriousness of the patient only.

1.7.3 Interval scales:

In an interval scale one can also carryout numerical differences but not the multiplication and division. In other words, an interval variable has the numerical distances between any two numbers. For example, suppose we are given the following temperature readings in Fahrenheit: $60^\circ, 65^\circ, 88^\circ, 105^\circ, 115^\circ$, and 120°. It can be written that $105^\circ > 88^\circ$ or $60^\circ < 65^\circ$ which means that 105° is warmer than 88° and that 60° is colder than 65°. It can also be written that $65^\circ - 60^\circ = 120^\circ - 115^\circ$ because equal temperature differences are equal conveying the same amount of heat needed to increase the temperature from an object from 60° to 65° and from 115° to 125°. However it does not mean that an object with temperature 120° is twice as hot as an object with temperature 60°, though 120° divided by 60° is 2. The reason is converting the temperature in to Celsius we have:

$$60^\circ \text{F} = \frac{5}{9}[60^\circ - 32^\circ]C = 15.570^\circ C \text{ and}$$

$$120^\circ \text{F} = \frac{5}{9}[120^\circ - 32^\circ]C = 48.870^\circ C$$

NOTE

It is impossible to compute ratios without a real origin as zero.

In the above equations, it is clear from the left hand side that 120° F is twice of 60° F while the right hand side says 48.87° C is more than three times of $15.57^\circ C$. The reason for the difficulty is that the Fahrenheit and Celsius scales have artificial origins namely zeros(freezing point of centigrade measure is 0^o C and the freezing point of Farenheit is 32^o F) and there is no such thing as 'no temperature.'

1.7.4 Ratio scales:

Ratio scales are important when it comes to measurement scales because they tell us about the order, they tell us the exact value between units, and they also have an absolute zero–which allows for a wide range of both descriptive and inferential statistics to be applied. Good examples of ratio variables include height and weight. Ratio scales provide a wealth of possibilities when it comes to statistical analysis. These variables can be meaningfully added, subtracted, multiplied, divided). Central tendency can be measured by mean, median, or mode; Measures of dispersion, such as standard deviation and coefficient of variation can also be calculated from ratio scales.

In summary, nominal variables are used to "name," or label a series of values. Ordinal scales provide good information about the order of choices, such as in a customer satisfaction survey. Interval scales give us the order of values plus the ability to quantify the difference between each one. Finally, Ratio scales give us the ultimate–order, interval values, plus the ability to calculate ratios since a "true zero" can be defined. The distinction made here among nominal, ordinal, interval and ratio data are very much important as these concepts used in computers for solving statistical problems using statistical packages like SPSS, SAS, R, STATA etc.,

Points to Remember	
● Characteristics of statistics	Aggregate of facts collected in systematic manner for a specific purpose. Affected by large number of causes to marked extent. Numerically expressed. Enumerated or estimated with a reasonable degree of accuracy. To be placed in relation to the other.
● Functions of Statistics	Collection, Classification, Condensation, Comparison, Correlation, Causation, Chance
● Scope and Applications	Actuarial science, Commerce, Economics, Medicine, Agriculture, Industry, Information Technology Government
● Applications of Big Data	Smarter Healthcare, Retail, Traffic control Manufacturing, Search Quality, Sales promotion
● Types of Data	Quantitative Data, Qualitative Data
● Measurement Scales	Nominal scale, Ordinal scale, Interval scale, Ratio scale

EXERCISE 1

5HBK2

I. Choose the best answer:

1. The number of days of absence per year that a worker has is an example of

   (a) Nominal scale (b) Ordinal scale (c) Interval scale (d) Ratio scale

2. The data that can be classified according to colour is

   (a) Nominal scale (b) Ordinal scale (c) Interval scale (d) Ratio scale

3. The rating of movies as good , average and bad is

   (a) Nominal scale (b) Ordinal scale (c) Interval scale (d) Ratio scale

4. The temperature of a patient during hospitalization is 100^0F is in

   (a) Nominal scale (b) Ordinal scale (c) Interval scale (d) Ratio scale

II. Fill in the blanks:

5. Statistics mainly deals with_____

6. Statistics is broadly classified as_____and _____

7. The measure used in statistics during primitive days is_____

8. Age of a student is _____variable

9. The founder of Indian Statistical Institute (ISI) is_____

10. Temperature in your city is in _____ scale of measurement.

11. Intelligence of a student is a _____ variable.

12. Colour of a car is in _____ scale of measurement.

13. The name of your representative in parliament is in _____ measurement.

14. Performance of a salesman is good. Good is in _____ scale of measurement.

III. Answer shortly:

15. Define statistics.

16. What is the meaning of data?

17. Explain the role of statistics in Actuarial science.

IV. Answer briefly:

18. Discuss the definition of Statistics due to Croxdon and Cowden.

19. List the characteristics of statistics.

20. What do you understand by Qualitative variable and quantitative variables?

V. Answer in detail:

21. Write a brief note on the contributions by P C Mahalonobis.

22. Write a note on the origin and growth of statistics

23. Explain the functions of statistics

24. State the applications of statistics in Agriculture and industry

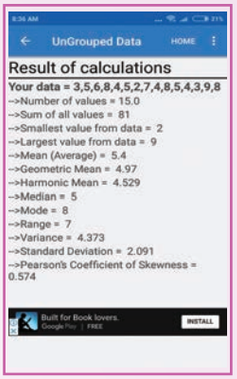
ANSWERS

I. 1. d 2. a 3. b 4. c

II. 5. numerical facts 6. singular and plural 7. counting 8. quantitative
9. P.C.Mahalanobis 10. interval 11. qualitative 12. nominal
13. nominal 14. ordinal

ICT CORNER

STATISTICAL ANALYSER



STATS IN YOUR PALM

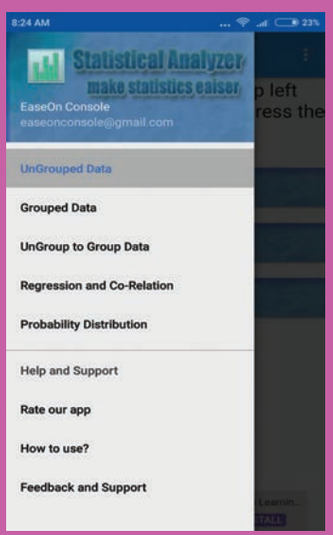
This activity is to calculate mean, median, range variance, standard deviation.

Steps:

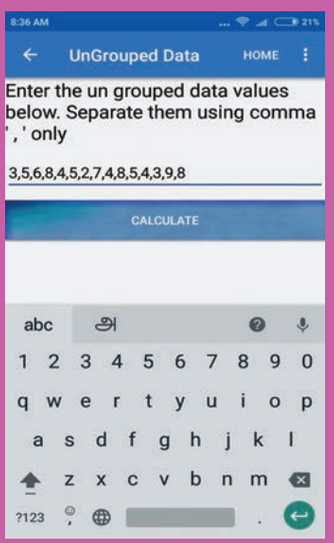
- This is an android app activity. Open the browser and type the URL given (or) scan the QR code. (Or) search for "**Statistical Analyzer**" in google play store.
- (i) Install the app and open the app, (ii) click "**Menu**", (iii) In the menu page click "**Ungrouped data**" menu.
- Type the raw data followed by comma for each entry and click "**CALCULATE**" to get the output.

Step-1

Step-2



Step-3



Pictures are indicatives only*

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https://play.google.com/store/apps/details?id=com.easeonconsole.malik.statisticcalculator