PREFACE

BASIC BUSINESS STATISTICS FOR MANAGEMENT AND ECONOMICS

This book is the result of my teaching experience in the subject and working experience in various softwares related to STATISTICS to Sikkim Manipal University,Udupi students for about 8 years.It is designed to meet the requirements of students at Bachelor's, Masters and Ph D levels in Engineering and Management(M E, MCA MBA and Ph D in Project Management,Engg,Computer Applications and Business Administration).

The main highlight of the book is the total solved problem approach for numerical question problems framed by the author with many theoretical concepts .This book has a large number of problems solved in all 24 chapters & many questions with answers and explanations.

I thank various International software makers in the field of Statistics which made me enable to work on tricky NUMERICAL PROBLEMS involving data ad almost all theoretical concepts r covered in this book.

There are many problems and all theoretical concepts related to Statistics framed by myself and can be best suitable for Bachelors,Masters & Ph D students during their RESEARCH WORK in the three fields mentioned below:

ENGINEERING-ALL FIELDS.(BACHELOR LEVEL,MASTERS LEVEL AND DOCTORS LEVEL)

COMPUTER APPLICATIONS. (BACHELOR LEVEL,MASTERS LEVEL AND DOCTORS LEVEL)

BUSINESS ADMINISTRATION. (BACHELORLEVEL,MASTERS LEVEL AND DOCTORS LEVEL)

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ABOUT THE BOOK

This book is on BASIC BUSINESS STATISTICS FOR MANAGEMENT AND ECONOMICS

which is a compulsory subject for Commerce students .Even the higher level students and bachelor level students can also read it as it contains a lot of numerical problems framed by me.

are the 24 chapters with various sub-topics covered in this book. Many theoretical questions with answers are given and explained and all formulae are also covered in this book.

Many short and big numerical questions with formulae and answers are also covered in this book.

I feel that this is a unique book as there are theory,formulae & numerical problems solved with all possible steps.

HAPPY READING.

THANKS

REGARDS

AUTHOR

(SRINIVAS R RAO)

ABOUT THE AUTHOR

Author's name is Srinivas R Rao, born and done his school level education in Mangalore,Karnataka in a reputed private school Canara High School and PUC(+2) from Canara PUC in Science stream with PCMB as main subjects.

Later, pursuing LL.B(5 Years) course passed the degree in 1999 and done Diploma in Export Management ,Diploma in Customs and Central Excise , Diploma in Business Administration and some important IT subjects like MS-Office,Internet/Email,Visual Basic 6.0,C,C++,Java,Advanced Java,Oracle with D2K,HTML with Javascript,VBscript and Active Server Pages.

Joined as a FACULTY for students in a small computer Institute in 2002 July and later after 4 months worked in a company by name CRP Technologies(I) .P.Ltd as Branch Manager(Risk Manager) for Mangalore,Udupi and Kasargod areas from January 26 2003 to June 11 2007.In the year 2005 pursued MBA distance education course. Currently working as a FACULTY in Sikkim Manipal University , Udupi centre for BBA & MBA students and teaching numerical subjects like Statistics/Operations Research(Mgt Science/Quant. Techniques for Mgt)/Accounting and several numerical and difficult oriented subjects for distance education students in their weekend contact classes from July 2010 till present day.

Thanks

Regards

Author

(SRINIVAS R RAO)

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CHAPTER 1

WHAT IS STATISTICS?

SECTIONS 1 - 4

MULTIPLE CHOICE QUESTIONS

In the following multiple-choice questions, please circle the correct answer.

1. You asked five of your classmates about their height. On the basis of this information, you stated that the average height of all students in your university or college is 65 inches. This is an example of:
   a. descriptive statistics
   b. statistical inference
   c. parameter
   d. population
   ANSWER: b

2. A company has developed a new computer sound card, but the average lifetime is unknown. In order to estimate this average, 200 sound cards are randomly selected from a large production line and tested and the average lifetime is found to be 5 years. The 200 sound cards represent the:
   a. parameter
   b. statistic
   c. sample
   d. population
   ANSWER: c

3. A summary measure that is computed from a sample to describe a characteristic of the population is called a
   a. parameter
   b. statistic
   c. population
   d. sample
   ANSWER: b

4. A summary measure that is computed from a population is called a
   a. parameter
   b. statistic
   c. population
   d. sample
   ANSWER: a

5. When data are collected in a statistical study for only a portion or subset of all elements of interest, we are using a:
   a. sample
   b. parameter
   c. population
   d. statistic
   ANSWER: a

6. Which of the following is not the goal of descriptive statistics?
   a. Summarizing data
   b. Displaying aspects of the collected data
   c. Reporting numerical findings
   d. Estimating characteristics of the population
   ANSWER: d

7. Which of the following statements is not true?
   a. One form of descriptive statistics uses graphical techniques
   b. One form of descriptive statistics uses numerical techniques
   c. In the language of statistics, population refers to a group of people
   d. Statistical inference is used to draw conclusions or inferences about characteristics of populations based on sample data
   ANSWER: c

8. Descriptive statistics deals with methods of:
   a. organizing data
   b. summarizing data
   c. presenting data in a convenient and informative way
   d. All of the above

ANSWER: d

9. A politician who is running for the office of governor of a state with 4 million registered voters commissions a survey. In the survey, 54% of the 5,000 registered voters interviewed say they plan to vote for her. The population of interest is the:
   a. 4 million registered voters in the state
   b. 5,000 registered voters interviewed
   c. 2,700 voters interviewed who plan to vote for her.
   d. 2,300 voters interviewed who plan not to vote for her

   ANSWER: a

10. A company has developed a new battery, but the average lifetime is unknown. In order to estimate this average, a sample of 500 batteries is tested and the average lifetime of this sample is found to be 225 hours. The 225 hours is the value of a:
   a. parameter
   b. statistic
   c. sample
   d. population

   ANSWER: b

11. The process of using sample statistics to draw conclusions about true population parameters is called
   a. inferential statistics
   b. the scientific method
   c. sampling method
   d. descriptive statistics

   ANSWER: a

12. Which of the following is most likely a population as opposed to a sample?
   a. Respondents to a magazine survey
   b. The first 10 students completing a final exam
   c. Every fifth student to arrive at the book store on your campus
   d. Registered voters in the State of Michigan

   ANSWER: d

13. Researchers suspect that the average number of credits earned per semester by college students is rising. A researcher at Michigan State University (MSU) wished to estimate the number of credits earned by students during the fall semester of 2003 at MSU. To do so, he randomly selects 500 student transcripts and records the number of credits each student earned in the fall term 2003. He found that the average number of semester credits completed was 14.85 credits per student. The population of interest to the researcher is
   a. all MSU students
   b. all college students in Michigan
   c. all MSU students enrolled in the fall semester of 2003
   d. all college students in Michigan enrolled in the fall semester of 2003

ANSWER: c

14. The collection and summarization of the graduate degrees and research areas of interest of the faculty in the University of Michigan of a particular academic institution is an example of
    a. inferential statistics
    b. descriptive statistics
    c. a parameter
    d. a statistic
    ANSWER: b

15. Those methods involving the collection, presentation, and characterization of a set of data in order to properly describe the various features of that set of data are called
    a. inferential statistics
    b. the scientific method
    c. sampling method
    d. descriptive statistics
    ANSWER: d

16. Which of the following is most likely a parameter as opposed to a statistic?
    a. The average score of the first ten students completing an assignment
    b. The proportion of females registered to vote in Kent County, Michigan
    c. The average height of 100 students randomly selected from a community college
    d. The proportion of cars stopped yesterday on US 131 that were cited for speeding
    ANSWER: b

17. A study is under way in a national forest to determine the adult height of pine trees. Specifically, the study is attempting to determine what factors aid a tree in reaching heights greater than 50 feet tall. It is estimated that the forest contains 32,000 pine trees. The study involves collecting heights from 500 randomly selected adult pine trees and analyzing the results. The sample in the study is
    a. the 500 randomly selected adult pine trees
    b. the 32,000 adult pine trees in the forest
    c. all the adult pine trees taller than 50 feet
    d. all pine trees, of any age in the forest
    ANSWER: a

18. The estimation of the population average student expenditure on education based on the sample average expenditure of 1,000 students is an example of
    a. inferential statistics
    b. descriptive statistics
    c. a parameter
    d. a statistic
    ANSWER: a

TRUE / FALSE QUESTIONS

19. When the purpose of the statistical inference is to draw a conclusion about a population, the *significance level*, as a measure of reliability, measures how frequently the conclusion will be correct in the long run.
ANSWER: F

20. A summary measure that is computed from a sample to describe a characteristic of the population is called a statistic.
ANSWER: T

21. The *confidence level* is the proportion of times that an estimating procedure will be wrong.
ANSWER: F

22. Conclusions and estimates about a population based on sample data are not always going to be correct. For this reason measures of reliability, such as the *significance level* and the *confidence level*, should be built into the statistical inference.
ANSWER: T

23. A university employs 2500 faculty and staff. To ascertain how the employees feel regarding a health insurance plan, 250 of the employees are surveyed. The proportion of the 250 employees who favor the health insurance plan is a parameter.
ANSWER: F

24. In a sample of 400 students in a college of business, 120 of them or 30% are marketing majors. The 30% is an example of statistical inference as opposed to descriptive statistics.
ANSWER: F

25. Twenty-five percent of a sample of 200 tennis players indicated that their parents did not play tennis. Based on this sample, we estimate that the 25% figure holds for the parents of all professional tennis players. This is an example of descriptive statistics as opposed to statistical inference.
ANSWER: F

26. A population is the totality of items or things of interest under consideration.
ANSWER: T

27. A local cable system using a sample of 800 subscribers estimates that forty percent of its subscribers watch premium channel at most four times a week. This is an example of statistical inference as opposed to descriptive statistics
ANSWER: T

28. A statistic is usually unobservable while a parameter is usually observable.

ANSWER: F

29. Statistical inference is the process of making an estimate, prediction, or decision about a population based on sample data.
ANSWER: T

30. A summary measure that is computed from a population is called a parameter.
ANSWER: T

31. A sample is the portion of the universe that is selected for analysis and making inferences about the population from which the sample is selected.
ANSWER: T

32. As a population becomes large, it is usually better to obtain statistical information from the entire population.
ANSWER: F

33. A statistic is usually used to provide an estimate for a usually unobserved parameter.
ANSWER: T

34. A sample is always a good representation of the target population.
ANSWER: F

35. Estimating characteristics of the population is the main goal of descriptive statistics.
ANSWER: F

STATISTICAL CONCEPTS & APPLIED QUESTIONS

36. In statistics, what name do we give to a numerical characteristic of a sample?

ANSWER:
Statistic

37. In statistics, what name do we give to a numerical characteristic of a population?

ANSWER:

Parameter

38. A manufacturer of children toys claims that less than 3% of his products are defective. When 500 toys were drawn from a large production run, 5% were found to be defective.
    a. What is the population of interest?
    b. What is the sample?
    c. What is the parameter?
    d. What is the statistic?
    e. Does the value 3% refer to the parameter or the statistic? Why?
    f. Does the value 5% refer to the parameter or the statistic? Why?
    g. Explain briefly how the statistic can be used to make inferences about the parameter to test the claim.

ANSWER:
a. The complete production run of toys
b. The 500 toys drawn from the production run
c. Proportion of the production run toys that are defective
d. Proportion of sample toys that are defective
e. Parameter; since it is a summary measure that is computed from the population
f. Statistic; since it is a summary measure that is computed from the sample
g. Since the sample proportion is more than 3%, we conclude that the claim is false.

39. The Human Resources Director of a large insurance company wishes to develop an employee health benefits package and decides to select 400 employees from a list of employees in order to study their preferences for the various components of a potential package. The 400 employees who will participate in this study constitute the _____.

ANSWER:
sample

40. The Human Resources Director of a large hospital in California wishes to develop an employee health benefits package and decides to select 300 employees from a list of all employees in order to study their preferences for the various components of a potential package. Information obtained from the sample will be used to draw conclusions about the true population _____.

ANSWER:
parameters

41. The Commissioner of Health in California State wanted to study malpractice litigation in Los Angeles. A sample of 32,000 medical records was drawn from a population of 3.5 million patients who were discharged during the year 2003. Using the information obtained from the sample to predict population characteristics with respect to malpractice litigation is an example of _____.

ANSWER:
inferential statistics

42. The Human Resources Director of a large automobile corporation in Michigan wishes to develop an employee pension package and decides to select 500 employees from a list of all auto workers in order to study their preference for the various components of a potential package. In this study, methods that result in decisions concerning population characteristics based only on the sample results are called _____.

ANSWER:
inferential statistics

43. The Commissioner of Health in California State wanted to study malpractice litigation in Los Angeles. A sample of 32,000 medical records was drawn from a population of 3.5 million patients who were discharged during the year 2003. The true proportion of malpractice claims filed from the population of 3.5 million patients is a _____.

ANSWER:
parameter

44. A businessman who is running for the vacant City Mayor seat with 25,000 registered voters conducts a survey. In the survey, 55% of the 500 registered voters interviewed say they planned to vote for him.
    a. What is the population of interest?
    b. What is the sample?
    c. Is the 55% a parameter or a statistic? Why?

ANSWER:

a. The political choices of the 25,000 registered voters.
b. The political choices of the 500 registered voters interviewed.
c. Statistic; since it is a summary measure that is computed from the sample

45. Define each of the following statistical terms:
    a. Descriptive statistics
    b. Statistical inference
    c. Confidence level
    d. Significance level
    e. Population
    f. Sample

ANSWER:

a. Descriptive statistics deals with methods of organizing, summarizing, and presenting data in a convenient and informative way.
b. Statistical inference is the process of making estimate, prediction, or decision about a population based on sample data.
c. The confidence level is a measure of reliability that measures the proportion of times that an estimating procedure will be correct.
d. The significance level is a measure of reliability that measures how frequently the conclusion about a population will be wrong in the long run.
e. A population is the group of all items of interest to a statistics practitioner. It is frequently very large and may, in fact, be infinitely large.
f. A sample is a set of data drawn from the population.

46. Identify each of the following studies as either descriptive statistics or statistical inference.
    a. Examine the weights of a sample of 75 manufacturer parts to see if the average weight of all the parts produced by the process is 2 pounds.
    b. Post the average final score for your statistics class.
    c. Estimate the percentage of the US population that will vote for John Kerry in the 2004 presidential election.
    d. Select a random sample of 100 babies born in 2003 and estimate the birth weight of all babies born during the same year.
    e. Examine the weights of a sample of 10 cans of corn to see if their average weight is 16 ounces.

ANSWER:

a. Statistical inference
b. Descriptive statistics
c. Statistical inference
d. Statistical inference
e. Descriptive statistics

47. The Commissioner of Health in California State wanted to study malpractice litigation in Los Angeles. A sample of 32,000 medical records was drawn from a population of 3.5 million patients who were discharged during the year 2003. The collection, presentation, and characterization of the data from patient medical records are examples of _____.

ANSWER:
descriptive statistics

48. The Human Resources Director of a large automobile corporation in Michigan wishes to develop an employee pension package and decides to select 500 employees from a list of all auto workers in order to study their preferences for the various components of a potential package. In this study, methods involving the collection, presentation, and characterization of the data are called _____.

ANSWER:
descriptive statistics

49. The Commissioner of Health in California State wanted to study malpractice litigation in Los Angeles. A sample of 30,000 medical records was drawn from a population of 3.5 million patients who were discharged during the year 2003. The proportion of malpractice claims filed from the 32,000 patients is a _____.

ANSWER:
statistic

50. The Human Resources Director at Michigan State University wishes to develop an employee benefits package and decides to select 500 employees from a list of all employees in order to study their preferences for the various components of a potential package. The Director will use the data from the sample to compute _____.

ANSWER:
statistics

51. The Human Resources Director at Florida State University wishes to develop an employee benefits package and decides to select 200 employees from a list of employees in order to study their preferences for the various components of a potential package. All the employees in the university constitute the _____.

ANSWER:
population

52. At Grand Rapids Community College 150 students are randomly selected and asked the distance of their commute to campus. From this group a mean of 18.2 miles is computed.
    a. What is the parameter?
    b. What is the statistics?
    c. What is the population?
    d. What is the sample?

    ANSWER:
    a. The mean commute distance for all students at the college
    b. The computed 18.2 miles
    c. All students enrolled at the college
    d. The 150 randomly selected students

53. Consider the population of all tennis players in the world. Define five samples that can be taken from this population.

    ANSWER:
    US tennis players, Female tennis players, Left-handed tennis players, Pro tennis players, and European tennis players who won US open

54. An office supply warehouse has boxes of pencils, 100 pencils to the box. Information about the entire warehouse as well as a sample of the boxes is shown below:

Number of defectives per box	Number of boxes in warehouse	Number of boxes in sample
0	1200	40
1	200	16
2	60	4
3	40	3
4	20	2
5	10	1

    A Quality Control inspector is interested in the number of boxes with three or more defectives.
    a. What is the value of the statistic?
    b. What is the value of the parameter?

    ANSWER:
    a. 6
    b. 70

55. Briefly describe the difference between parameter and statistic, and give an example of each.

ANSWER:
A parameter is a descriptive measure of a population.
Example: The mean number of soft drinks consumed by all students at the University of Michigan.
A statistics is a descriptive measure of a sample
Example: The mean number of soft drinks consumed last week by a sample of 250 students from the University of Michigan.

CHAPTER 2

GRAPHICAL AND TABULAR DESCRIPTIVE TECHNIQUES

SECTIONS 1

MULTIPLE CHOICE QUESTIONS

In the following multiple-choice questions, please circle the correct answer.

1. Which of the following statements is false?