Smu i sem stat assignments set 2

Science, Statistics

STATISTICS FOR MANAGEMENT

Credits (Book ID: B1129) Assignment Set- 1 (60 Marks) Note: Each question carries 10 Marks. Answer all the questions 1. What do you mean by Statistical Survey? Differentiate between " Questionnaire" and " Schedule". ANS: Definition of statistical survey: A Statistical survey is a scientific process of collection and analysis of numerical data. Statistical surveys are used to collect numerical information about units in a population. Surveys involve asking questions to individuals. Surveys of human populations are common in government, health, socialscienceand marketing sectors.

Stages of Statistical Survey: Statistical surveys are categorized into two stages – planning and execution. The two broad stages of Statistical survey AS FOLLOWS: [pic] Planning a Statistical Survey: The relevance and accuracy of data obtained in a survey depends upon the care exercised in planning. A properly planned investigation can lead to best results with least cost and time. Steps involved in the planning stage are as follows: Step 1: Nature of the problem to be investigated should be clearly defined in an unambiguous manner. Step 2: Objectives of the investigation should be stated at the outset.

- Objectives could be to:
- Obtain certain estimates
- Establish a theory
- Verify an existing statement
- Find relationship between characteristics

Step 3: The scope of the investigation has to be made clear. The scope of investigation refers to the area to be covered, identification of units to be studied, nature of characteristics to be observed, accuracy of measurements, analytical methods, time, cost and other resources required. Step 4: Whether to use data collected from primary or secondary source should be determined in advance.

Step 5: the organization of investigation is the final step in the process. It encompasses the determination of the number of investigators required, their training, supervision work needed, funds required. Execution of Statistical survey: Control methods should be adopted at every stage of carrying out the investigation to check the accuracy, coverage, methods of measurements, analysis and interpretation. The collected data should be edited, classified, tabulated and presented in diagrams and graphs. The data should be carefully and systematically analysed and interpreted.

Differentiate between “ Questionnaire” and “ Schedule”: Questionnaires contain simple questions and are filled by respondents. Schedules also contain questions but responses are recorded directly by the investigator.

The table shows the data of Expenditure of afamilyonfood, clothing, education, rent and other items. Depict the data shown in the table using Pie chart.

Items	Expenditure
Food	4300

Clothing	1200
Education	700
Rent	2000
Others	600

ANS: [pic] Fig: Pie-chart showing expenditure of a family on various items

Average weight of 100 screws in box A is 10. 4 gms. It is mixed with 150 screws of box B. Average weight of mixed screws is 10. 9 gms. Find the average weight of screws of box B. ANS: GIVEN THAT:

- n1= 100,
- n2 = 150,
- X1 = 10. 4 Gms,
- [pic]= 10. 9 Gms,

X2 =? WE KNOW THAT: [pic] 10. 9 = (100*10. 4) + (150 X2) / 100+150 10. 9 = 1040 + 150 X2 / 250 0. 9*250 = 1040 + 150 X2 2725 = 1040 + 150 X2 150 = 2725-1040 X2 = 1685 / 150 X2 = 11. 23 Gms Therefore, the average weight of screws of box B is 11. 23 gms. Discuss the rules of " Probability".

What is meant by " Conditional Probability"? ANS:

Addition rule: The addition rule of probability states that: i) If ' A' and ' B' are any two events then the probability of the occurrence of either ' A' or ' B' is given by: [pic] ii) If ' A' and ' B' are two mutually exclusive events then the probability of occurrence of either A or B is given by: [pic] ii) If A, B and C are

any three events then the probability of occurrence of either A or B or C is given by: [pic] In terms of Venn diagram, from the figure 5. 4, we can calculate the probability of occurrence of either event ‘ A’ or event ‘ B’, given that event ‘ A’ and event ‘ B’ are dependent events. From the figure 5. 5, we can calculate the probability of occurrence of either ‘ A’ or ‘ B’, given that, events ‘ A’ and ‘ B’ are independent events. From the figure 5. 6, we can calculate the probability of occurrence of either ‘ A’ or ‘ B’ or ‘ C’, given that, events ‘ A’, ‘ B’ and ‘ C’ are dependent events. pic] iv) If A1, A2, A3……., An are ‘ n’ mutually exclusive and exhaustive events then the probability of occurrence of at least one of them is given by: [pic] 2. Multiplication rule: If ‘ A’ and ‘ B’ are two independent events then the probability of occurrence of ‘ A’ and ‘ B’ is given by: [pic] Conditional Probability: Sometimes we wish to know the probability that the price of a particular petroleum product will rise, given that thefinanceminister has increased the petrol price. Such probabilities are known as conditional probabilities.

Thus the conditional probability of occurrence of an event ‘ A’ given that the event ‘ B’ has already occurred is denoted by P (A / B). Here, ‘ A’ and ‘ B’ are dependent events. Therefore, we have the following rules. If ‘ A’ and ‘ B’ are dependent events, then the probability of occurrence of ‘ A and B’ is given by: [pic] It follows that: [pic] For any bivariate distribution, there exists two marginal distributions and ‘ m + n’ conditional distributions, where ‘ m’ and ‘ n’ are the number of classifications/characteristics studied on two variables.

What is meant by “ Hypothesis Testing”?

Give Examples (b) Differentiate between “ Type-I” and “ Type-II” Errors ANS: Hypothesis Testing: Hypothesis testing is about making inferences about a

population from only a small sample. The bottom line in hypothesis testing is when we ask ourselves (and then decide) whether a population, like we think this one, would be likely to produce a sample like the one we are looking at. Testing Hypothesis: In hypothesis testing, we must state the assumed or hypothesised value of the population parameter before we begin sampling. The assumption we wish to test is called the null hypothesis and is symbolised by ?

Ho". The term null hypothesis arises from earlier agricultural and medical applications of statistics. In order to test the effectiveness of a new fertiliser or drug, the tested hypothesis (the null hypothesis) was that it had no effect, that is, there was no difference between treated and untreated samples. If we use a hypothesised value of a population mean in a problem, we would represent it symbolically as ? H0. This is read - The hypothesized value of the population mean. If our sample results fail to support the null hypothesis, we must conclude that something else is true.

Whenever we reject the hypothesis, the conclusion we do accept is called the alternative hypothesis and is symbolised H1 (" H sub-one"). Interpreting the level of significance: The purpose of hypothesis testing is not to question the computed value of the sample statistic but to make a judgment about the difference between that sample statistic and hypothesised population parameter. The next step after stating the null and alternative hypotheses is to decide what criterion to be used for deciding whether to accept or reject the null hypothesis.

If we assume the hypothesis is correct, then the significance level will indicate the percentage of sample means that is outside certain limits (In

estimation, the confidence level indicates the percentage of sample means that falls within the defined confidence limits). Hypotheses are accepted and not proved: Even if our sample statistic does fall in the non-shaded region (the region shown in below figure that makes up 95 percent of the area under the curve), this does not prove that our null hypothesis (H0) is true; it simply does not provide statistical evidence to reject it.

Why? It is because the only way in which the hypothesis can be accepted with certainty is for us to know the population parameter; unfortunately, this is not possible. Therefore, whenever we say that we accept the null hypothesis, we actually mean that there is not sufficient statistical evidence to reject it. Use of the term accept, instead of do not reject, has become standard. It means that when sample data do not cause us to reject a null hypothesis, we behave as if that hypothesis is true. [pic] fig: Acceptance and rejection region of sample

Selecting a Significance Level: There is no single standard or universal level of significance for testing hypotheses. In some instances, a 5% level of significance is used. In the published results of research papers, researchers often test hypotheses at the 1 percent level of significance. Hence, it is possible to test a hypothesis at any level of significance. But remember that our choice of the minimum standard for an acceptable probability, or the significance level, is also the risk we assume of rejecting a null hypothesis when it is true.

The higher the significance level we use for testing a hypothesis, the higher the probability of rejecting a null hypothesis when it is true. 5% level of significance implies we are ready to reject a true hypothesis in 5% of cases.

If the significance level is high then we would rarely accept the null hypothesis when it is not true but, at the same time, often reject it when it is true. When testing a hypothesis we come across four possible situations. The above figure shows the four possible situations. [pic] Table: Possible situations when testing a hypothesis

The combinations are:

- If the hypothesis is true, and the test result accepts it, then we have made a right decision.
- If hypothesis is true, and the test result rejects it, then we have made a wrong decision (Type I error). It is also known as Consumer? s Risk, denoted by ?.
- If hypothesis is false, and the test result accepts it, then we have made a wrong decision (Type II error). It is known as producer? s risk, denoted by ? 1 – P is called power of the Test.

Hypothesis is false, test result rejects it – we have made a right decision. Type-I" and " Type-II" Errors: Suppose that making a Type I error (rejecting a null hypothesis when it is true) involves the time and trouble of reworking a batch of chemicals that should have been accepted. At the same time, making a Type II error (accepting a null hypothesis when it is false) means taking a chance that an entire group of users of this chemical compound will be poisoned. Obviously, the management of this company will prefer a Type I error to a Type II error and, as a result, will set very high levels of significance in its testing to get low ?? . Suppose, on the other hand, that making a Type I error involves disassembling an entire engine at the factory, but making a Type II error involves relatively inexpensive warranty repairs by

the dealers. Then the manufacturer is more likely to prefer a Type II error and will set lower significance levels in its testing. 6. From the following table, calculate Laspyres Index Number, Paasches Index Number, Fisher? s Price Index Number and Dorbish & Bowley? s Index Number taking 2008 as the base year.