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STATISTICS WORKSHEET-8

Q1 to Q12 have only one correct answer. Choose the correct option to answer your question.

1. In hypothesis testing, type II error is represented by β and the power of the test is $1-\beta$ then β is:

a. The probability of rejecting H_0 when H_1 is true

b. The probability of failing to reject H_0 when H_1 is true

c. The probability of failing to reject H_1 when H_0 is true

d. The probability of rejecting H_0 when H_1 is true

Ans:- (A) The probability of rejecting H_0 when H_1 is true

2. In hypothesis testing, the hypothesis which is tentatively assumed to be true is called the

a. correct hypothesis

b. null hypothesis

c. alternative hypothesis

d. level of significance

Ans:- (B) null hypothesis

3. When the null hypothesis has been true, but the sample information has resulted in the rejection of the null, a _____ has been made

a. level of significance

b. Type II error

c. critical value

d. Type I error

Ans:- (D) Type I error

4. For finding the p-value when the population standard deviation is unknown, if it is reasonable to assume that the population is normal, we use

a. the z distribution

b. the t distribution with n - 1 degrees of freedom

c. the t distribution with n + 1 degrees of freedom

d. none of the above

Ans:- (B) the t distribution with n - 1 degrees of freedom

5. A Type II error is the error of

a. accepting Ho when it is false

b. accepting Ho when it is true

c. rejecting Ho when it is false

d. rejecting Ho when it is true

Ans:- (A) accepting Ho when it is false

6. A hypothesis test in which rejection of the null hypothesis occurs for values of the point estimator in either tail of the sampling distribution is called

a. the null hypothesis

b. the alternative hypothesis

c. a one-tailed test

d. a two-tailed test

Ans:- (D) a two-tailed test

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7. In hypothesis testing, the level of significance is

a. the probability of committing a Type II error

b. the probability of committing a Type I error

c. the probability of either a Type I or Type II, depending on the hypothesis to be tested

d. none of the above

Ans:- (B) the probability of committing a Type I error

8. In hypothesis testing, b is

a. the probability of committing a Type II error

b. the probability of committing a Type I error

c. the probability of either a Type I or Type II, depending on the hypothesis to be test

d. none of the above

Ans:- (A) the probability of committing a Type I error

9. When testing the following hypotheses at an α level of significance

H_0: p = 0.7

H_1: p > 0.7

The null hypothesis will be rejected if the test statistic Z is

a. $z > z_\alpha$

b. $z < z_\alpha$

c. $z < -z$

d. none of the above

Ans:- (C) $z < -z$

10. Which of the following does not need to be known in order to compute the P-value?

a. knowledge of whether the test is one-tailed or two-tail

b. the value of the test statistic

c. the level of significance

d. All of the above are needed

Ans:- (C) the level of significance

11. The maximum probability of a Type I error that the decision maker will tolerate is called the

a. level of significance

b. critical value

c. decision value

d. probability value

Ans:- (A) the level of significance

12. For t distribution, increasing the sample size, the effect will be on

a. Degrees of Freedom

b. The t-ratio

c. Standard Error of the Means
d. All of the Above

Ans:- (B) The t-ratio

Q13 to Q15 are subjective answers type questions. Answers them in their own words briefly.

13. What is Anova in SPSS?

Ans:- Analysis of Variance, i.e. ANOVA in SPSS, is used for examining the differences in the mean values of the dependent variable associated with the effect of the controlled independent variables, after taking into account the influence of the uncontrolled independent variables. Essentially, ANOVA in SPSS is used as the test of means for two or more populations.
ANOVA in SPSS must have a dependent variable which should be metric (measured using an interval or ratio scale). ANOVA in SPSS must also have one or more independent variables, which should be categorical in nature. In ANOVA in SPSS, categorical independent variables are called factors. A particular combination of factor levels, or categories, is called a treatment. In ANOVA in SPSS, there is one way ANOVA which involves only one categorical variable, or a single factor. For example, if a researcher wants to examine whether heavy, medium, light and nonusers of cereals differed in their preference for Total cereal, then the differences can be examined by the one way ANOVA in SPSS. In one way ANOVA in SPSS, a treatment is the same as the factor level.

14. What are the assumptions of Anova?

Ans:- ANOVA assumes that the data is normally distributed. The ANOVA also assumes homogeneity of variance, which means that the variance among the groups should be approximately equal. ANOVA also assumes that the observations are independent of each other. Researchers should keep in mind when planning any study to look out for extraneous or confounding variables. ANOVA has methods (i.e., ANCOVA) to control for confounding variables.

Testing of the Assumptions

The population from which samples are drawn should be normally distributed.
2. Independence of cases: the sample cases should be independent of each other.
3. Homogeneity of variance: Homogeneity means that the variance among the groups should be approximately equal. These assumptions can be tested using statistical software (like Intellectus Statistics!). The assumption of homogeneity of variance can be tested using tests such as Levene's test or the Brown-Forsythe Test. Normality of the distribution of the scores can be tested using histograms, the values of skewness and kurtosis, or using tests such as Shapiro-Wilk or Kolmogorov-Smirnov. The assumption of independence can be determined from the design of the study.

It is important to note that ANOVA is not robust to violations to the assumption of independence. This is to say, that even if you violate the assumptions of homogeneity or normality, you can conduct the test and basically trust the findings. However, the results of the ANOVA are invalid if the independence assumption is violated. In general, with violations of homogeneity the analysis is considered robust if you have equal sized groups. With violations of normality, continuing with the ANOVA is generally ok if you have a large sample size.

15. What is the difference between one way Anova and two way Anova?

Ans:- The only difference between one-way and two-way ANOVA is the number of independent variables. A one-way ANOVA has one independent variable, while a two-way ANOVA has two.

One-way ANOVA: Testing the relationship between shoe brand (Nike, Adidas, Saucony, Hoka) and race finish times in a marathon.

Two-way ANOVA: Testing the relationship between shoe brand (Nike, Adidas, Saucony, Hoka), runner age group (junior, senior, master's), and race finishing times in a marathon.

BASIS FOR COMPARISON	ONE WAY ANOVA	TWO WAY ANOVA
Meaning	One way ANOVA is a hypothesis test, used to test the equality of three of more population means simultaneously using variance.	Two way ANOVA is a statistical technique wherein, the interaction between factors, influencing variable can be studied.
Independent Variable	One	Two
Compares	Three or more levels of one factor.	Effect of multiple level of two factors.
Number of Observation	Need not to be same in each group.	Need to be equal in each group.
Design of experiments	Need to satisfy only two principles.	All three principles needs to be satisfied.