STATISTICS WORKSHEET-9

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

1. The owner of a travel agency would like to determine whether or not the mean age of the agency's customers is over 24. If so, he plans to alter the destination of their special cruises and tours. If he concludes the mean age is over 24 when it is not, he makes a_____error. If he concludes the mean age is not over 24 when it is, he makes a _____error.
a. Type II; Type II
b. Type I; Type I
c. Type I; Type II
d. Type II; Type I

Ans- (C)**Type I; Type II**

2. Suppose we wish to test H_0: $\mu = 53$ vs H_1: $\mu > 53$. What will result if we conclude that the mean is greater than 53 when its true value is really 55?
a. We have made a Type I error
b. We have made a correct decision
c. We have made a Type II error
d. None of the above are correct

Ans:- (B)We have made a correct decision

3. The value that separates a rejection region from an acceptance region is called a_____.
a. parameter
b. critical value
c. confidence coefficient
d. significance level

Ans:- (B) critical value

4. A hypothesis test is used to prevent a machine from under filling or overfilling quart bottles of beer. On the basis of sample, the machine is shut down for inspection. A thorough examination reveals there is nothing wrong with the filling machine. From a statistical point of view:
a. Both Type I and Type II errors were made.
b. **A Type I error was made**.
c. A Type II error was made.
d. A correct decision was made.

Ans- A Type I error was made

5. Suppose we wish to test H_0 : $\mu = 21$ vs H_1 : $\mu > 21$. Which of the following possible sample results gives the most evidence to support H_1 (i.e., reject H_0)? Hint: Compute Z-score.
a. x = 23 s , = 3
b. x = 19 s , = 4
c. x = 17 s , = 7
d. x = 18 s , = 6

Ans:- **c. x = 17 s , = 7**

6. Given H_0: μ = 25, H_1: μ ≠ 25, and P-value = 0.041. Do you reject or fail to reject H0 at the 0.01 level of significance?

a. fail to reject H0

b. not sufficient information to decide

c. reject H_0

Ans:- c. x = 17 s , = 7

7. A bottling company needs to produce bottles that will hold 12 ounces of liquid. Periodically, the company gets complaints that their bottles are not holding enough liquid. To test this claim, the bottling company randomly samples 36 bottles. Suppose the p-value of this test turned out to be 0.0455. State the proper conclusion.
a. At α = 0.085, fail to reject the null hypothesis.
b. At α = 0.035, accept the null hypothesis.
c. At α = 0.05, reject the null hypothesis.
d. At α = 0.025, reject the null hypothesis.

Ans:- **At α = 0.05, reject the null hypothesis.**

8. If a hypothesis test were conducted using α = 0.05, for which of the following p-values would the null hypothesis be rejected?
a. 0.100
b. 0.041
c. 0.055
d. 0.060

Ans:- **b. 0.041**

9 . For H_1: $\mu > \mu_0$ p-value is 0.042. What will be the p-value for Ha: $\mu < \mu o$?
a. 0.084
b. 0.021
c. 0.958
d. 0.042

Ans:- **c. 0.958**

10. The test statistic is t = 2.63 and the p-value is 0.9849. What type of test is this?
a. Right tail
b. Two tail
c. Left tail
d. Can't tell

Ans:- **Left tail**

11. The test statistic is z =2.75, the critical value is z = 2.326. The *p*- value is …
a. Less than the significance level
b. Equal to the significance level
c. Large than the significance level

Ans:- **Less than the significance level**

12. The area to the left of the test statistic is 0.375. What is the probability value if this is a left tail test?
a. 0.750
b. 0.375
c. 0.1885
d. 0.625

Ans:- **b. 0.375**

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

13.What is T distribution and Z distribution?

Ans:- A t-distribution is a type of probability function that is used for estimating population parameters for small sample sizes or unknown variances. The t-distribution is used in statistics to estimate the population parameters for small sample sizes or undetermined variances. It is also referred to as the Student's t-distribution. The t-distribution is a way of describing a set of observations where most observations fall close to the mean, and the rest of the observations make up the tails on either side. It is a type of normal distribution used for smaller sample sizes, where the variance in the data is unknown.

A z-score, or z-statistic, is a number representing how many standard deviations above or below the mean population the score derived from a z-test is. Essentially, it is a numerical measurement that describes a value's relationship to the mean of a group of values. The standard normal or z-distribution assumes that you know the population standard deviation. a probability density function and especially a normal distribution that has a mean equal to zero and a standard deviation equal to one and that is used especially in testing hypotheses about means or proportions of samples drawn from populations whose population standard deviations are known. The z-score is particularly important because it tells you not only something about the value itself, but also where the value lies in the distribution.

14.Is the T distribution normal?

Ans:- The *t*-distribution is a type of normal distribution that is used for smaller sample sizes. Normally-distributed data form a bell shape when plotted on a graph, with more observations near the mean and fewer observations in the tails.

The *t*-distribution is used when data are *approximately* normally distributed, which means the data follow a bell shape but the population variance is unknown. The variance in a *t*-distribution is estimated based on the degrees of freedom of the data set (total number of observations minus 1).
It is a more conservative form of the **standard normal distribution**, also known as the *z*-distribution. This means that it gives a lower probability to the center and a higher probability to the tails than the standard normal distribution.

Example: *t*-distribution vs *z*-distributionIf you measure the average test score from a sample of only 20 students, you should use the *t*-distribution to estimate the confidence interval around the mean. If you use the *z*-distribution, your confidence interval will be artificially precise. As the **degrees of freedom** (total number of observations minus 1) increases, the *t*-distribution will get closer and closer to matching the standard normal distribution, a.k.a. the *z*-distribution, until they are almost identical.

Above 30 degrees of freedom, the *t*-distribution roughly matches the *z*-distribution. Therefore, the *z*-distribution can be used in place of the *t*-distribution with large sample sizes.
The *z*-distribution is preferable over the *t*-distribution when it comes to making statistical estimates because it has a known variance. It can make more precise estimates than the *t*-distribution, whose variance is approximated using the degrees of freedom of the data.

15.What does the T distribution tell us?

Ans:- The t-distribution describes the standardized distances of sample means to the population mean when the population standard deviation is not known, and the observations come from a normally distributed population. You must use the t-distribution table when working problems when the population standard deviation (σ) is not known and the sample size is small (n<30). General Correct Rule: If σ is not known, then using t-distribution is correct. This method is applied for hypothesis testing in statistics, medicine, finance, and business. Also, it is used to find extreme values—the lower and the upper limits of the confidence interval. Moreover, it is used for determining P-values in t-tests and the coefficients of regression analysis.