STATISTICS WORKSHEET-2

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.

Ans- c. Type I; Type II

2. Suppose we wish to test H0: $\mu = 53$ vs H1: $\mu > 53$. What will result if we conclude that the mean is greater than 53 when its true value is really 55?

Ans- b. We have made a correct decision

3. The value that separates a rejection region from an acceptance region is called a _____.

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:

Ans- d. A correct decision was made.

5. Suppose we wish to test H0 : $\mu = 21$ vs H1 : $\mu > 21$. Which of the following possible sample results gives the most evidence to support H1 (i.e., reject H0)? Hint: Compute Z-score.

Ans- c. x = 17 s , = 7

6. Given H0: $\mu = 25$, H1: $\mu \neq 25$, and P-value = 0.041. Do you reject or fail to reject H0 at the 0.01 level of significance?

Ans- a. fail to reject H0

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.

Ans- c. At $\alpha = 0.05$, reject the null hypothesis.

8. If a hypothesis test were conducted using $\alpha = 0.05$, for which of the following p-values would the null hypothesis be rejected?

Ans- b. 0.041

9 . For H1: $\mu > \mu 0$ p-value is 0.042. What will be the p-value for Ha: $\mu < \mu o$?

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?

Ans- c. Left tail

11. The test statistic is z =2.75, the critical value is z = 2.326. The p- value is …

Ans- a. 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?

Ans- b. 0.375

13.What is T distribution and Z distribution?

Ans-

z-Distribution: The z-distribution, also called the standard normal distribution, i.e. it has a mean of 0 and standard deviation of 1., is used in calculations for inference when the population standard deviation is known, or when sample sizes are large (at least 30).

t-Distribution: The t-distribution, also called the Student's t-distribution, is used in calculations for inference. However, the t-distribution is not based on the population standard deviation, rather, it is based on the sample standard deviation and degrees of freedom. t-distribution is sensitive to sample size and is used for small or moderate samples when the population standard deviation is unknown.

As sample sizes increase, the t-distribution approaches the z-distribution. Thus, for samples of size 30 or larger, the z-distribution is generally used, even if the population standard deviation is not known.

Formulas:

$$z = (X - \mu) / \sigma$$

where,

X is a normal random variable, μ is the mean of X, and σ is the standard deviation of X

$$t = \frac{\bar{x} - \mu}{\frac{s}{\sqrt{N}}}$$

Where, $\bar{x}$ is the mean of first sample.

μ is the mean of second sample.

$\frac{s}{\sqrt{N}}$ = the estimate of the standard error of difference between the means.

How to Determine When to Use a z-Distribution or a t-Distribution

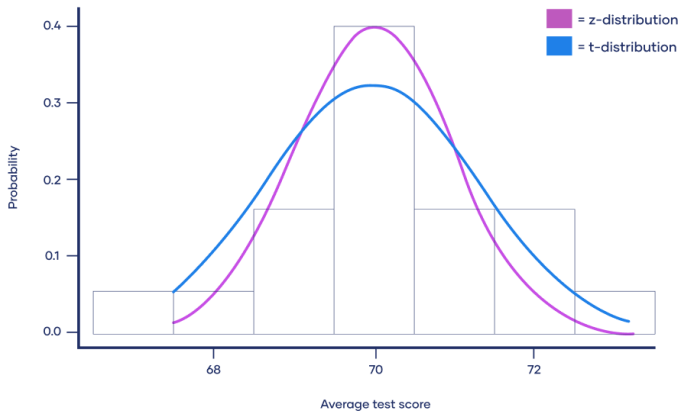
- **Step 1: Identify the sample size, n**
  If n ≥30, use the z-distribution.
  If n <30, move on to step 2.

- **Step 2: Determine if the population standard deviation is known.**
  If the population standard deviation is known, use the z-distribution.
  If the population standard deviation is not known, use the t-distribution.

14.Is the T distribution normal?

Ans- Yes, the T distribution is normal. The t-distribution is a way of describing data that follow a bell curve when plotted on a graph, with the greatest number of observations close to the mean and fewer observations in the tails.

It is a type of normal distribution used for smaller sample sizes, where the variance in the data is unknown.



15.What does the T distribution tell us?

Ans- 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).

- **<u>T-distribution and T Score:</u> A t-score is the number of standard deviations from the mean in a t-distribution. You can typically look up a t-score in a t-table, or by using an online t-score calculator.**

  In statistics, t-scores are primarily used to find two things:

  1. **The upper and lower bounds of a confidence interval when the data are approximately normally distributed.**
  2. **The p-value of the test statistic for t-tests and regression tests.**

- **<u>T-scores and confidence intervals:</u> Confidence intervals use t-scores to calculate the upper and lower bounds of the prediction interval. The t-score used to generate the upper and lower bounds is also known as the critical value of t, or t*.**

- **<u>T-scores and p-values:</u> Statistical tests generate a test statistic showing how far from the null hypothesis of the statistical test your data is. They then calculate a p-value that describes the likelihood of your data occurring if the null hypothesis were true.**

  The test statistic for t-tests and regression tests is the t-score. While most statistical programs will automatically calculate the corresponding p-value for the t-score, you can also look up the values in a t-table, using your degrees of freedom and t-score to find the p-value. The t-score which generates a p-value below your threshold for statistical significance is known as the critical value of t, or t*.