

**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)**

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:-(A)**

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)**

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:-(D)**

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.  $\bar{x} = 23$ ,  $s = 3$
- b.  $\bar{x} = 19$ ,  $s = 4$
- c.  $\bar{x} = 17$ ,  $s = 7$
- d.  $\bar{x} = 18$ ,  $s = 6$

**Ans:-(C)**

6. Given  $H_0: \mu = 25$ ,  $H_1: \mu \neq 25$ , and  $P\text{-value} = 0.041$ . Do you reject or fail to reject  $H_0$  at the 0.01 level of significance?

- a. fail to reject  $H_0$
- b. not sufficient information to decide
- c. reject  $H_0$

**Ans:-(C)**

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  $\alpha = 0.085$ , fail to reject the null hypothesis.
- b. At  $\alpha = 0.035$ , accept the null hypothesis.
- c. At  $\alpha = 0.05$ , reject the null hypothesis.
- d. At  $\alpha = 0.025$ , reject the null hypothesis.

**Ans:-(C)**

8. If a hypothesis test were conducted using  $\alpha = 0.05$ , 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)**

9. For  $H_1: \mu > \mu_0$  p-value is 0.042. What will be the p-value for  $H_a: \mu < \mu_0$ ?

- a. 0.084
- b. 0.021
- c. 0.958
- d. 0.042

**Ans:-(C)**

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:-(B)**

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:-(A)**

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)**

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

13. What is T distribution and Z distribution?

**Ans:-** T-distribution and Z-distribution are probability distributions that are commonly used in statistical hypothesis testing.

Z-distribution, also known as the standard normal distribution, is a continuous probability distribution that has a mean of 0 and a standard deviation of 1. The Z-distribution is used when the population standard deviation is known and the sample size is large (typically  $n > 30$ ). The Z-distribution is commonly used in hypothesis testing, especially for tests involving population means.

T-distribution, also known as the Student's t-distribution, is a continuous probability distribution that has a bell-shaped curve similar to the normal distribution. However, unlike the normal distribution, the shape of the t-distribution depends on the sample size and the degrees of freedom (df). The t-distribution is used when the population standard deviation is unknown and the sample size is small (typically  $n < 30$ ). The t-distribution is commonly used in hypothesis testing, especially for tests involving population means.

Both the Z-distribution and T-distribution are important in statistical inference and hypothesis testing, and the choice between the two distributions depends on the characteristics of the sample and the problem being studied.

14. Is the T distribution normal?

**Ans:-** The t-distribution is similar to the standard normal distribution (Z distribution) in shape but has heavier tails, meaning it has more probability in the tails and less in the center compared to the standard normal distribution. However, as the sample size increases, the t-distribution approaches the normal distribution. So, for a large sample size (typically,  $n > 30$ ), the t-distribution can be approximated by the normal distribution. Therefore, the t-distribution is not normal but can approximate the normal distribution under certain conditions.

15. What does the T distribution tell us?

**Ans:-** The t-distribution tells us the probability of observing a certain t-value when we take a random sample from a population whose mean and standard deviation are unknown. It is used when we want to make inferences about the population mean based on a sample. The t-distribution is similar to the normal distribution, but it has heavier tails, which means it has more probability in the tails and less in the center compared to the normal distribution. The shape of the t-distribution depends on the degrees of freedom, which is the sample size minus one. As the sample size increases, the t-distribution approaches the normal distribution.