

STATISTICS WORK SHEET SET 02 Assignment 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

Answer: 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

Answer: a. We have made a Type I error

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

Answer: 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.**

Answer: d. A correct decision 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**

Answer: d. $x = 18$ s , = 6

6. Given $H_0: \mu = 25$, $H_1: \mu \neq 25$, and P-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

Answer: a. fail to reject H_0

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.

Answer: 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?

- a. 0.100
- b. 0.041
- c. 0.055
- d. 0.060

Answer: b. 0.041

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

Answer: b. 0.021

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

Answer: c. 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

Answer: 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?

- a. 0.750
- b. 0.375
- c. 0.1885
- d. 0.625

Answer: 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?

Answer:

T-distribution and Z-distribution are probability distributions commonly used in statistics.

Z-Distribution: The 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. It is used to standardize

variables and calculate probabilities based on standard deviations from the mean. It is often used in hypothesis testing, confidence interval estimation, and other statistical analysis.

T-Distribution: The T-distribution, also known as the Student's t-distribution, is a continuous probability distribution that is similar to the Z-distribution but is used when the sample size is small or the population standard deviation is unknown. The shape of the T-distribution is similar to the normal distribution, but it has heavier tails, meaning it has more variability in the extremes. It is often used in hypothesis testing, confidence interval estimation, and other statistical analysis when the sample size is small.

In summary, the Z-distribution is used when the sample size is large, and the population standard deviation is known, while the T-distribution is used when the sample size is small, or the population standard deviation is unknown.

14. Is the T distribution normal?

Answer:

The T-distribution is similar to the normal distribution in shape, but it is not the same as the normal distribution. While the normal distribution has a fixed mean and standard deviation, the T-distribution has a mean of 0 and a varying standard deviation that depends on the sample size.

The T-distribution has heavier tails than the normal distribution, which means it has more probability mass in the tails of the distribution. This is because the T-distribution incorporates additional uncertainty due to the small sample size. As the sample size approaches infinity, the T-distribution approaches the normal distribution.

In summary, the T-distribution is not normal, but it is similar to the normal distribution, especially as the sample size becomes large.

15. What does the T distribution tell us?

Answer:

The T-distribution is a probability distribution that tells us the likelihood of obtaining a certain sample mean when we are dealing with a small sample size, and the population standard deviation is unknown.

More specifically, the T-distribution is used in hypothesis testing and confidence interval estimation. In hypothesis testing, it tells us whether the difference between two groups is statistically significant, and in confidence interval estimation, it tells us the range of values that we can be confident the true population mean lies within.

The T-distribution takes into account the variability of the sample mean due to the small sample size, and provides a distribution of possible means. This distribution is centered around the sample mean and has wider tails than the normal distribution, indicating that there is more uncertainty in the estimate of the true population mean when dealing with small sample sizes.

In summary, the T-distribution provides a way to estimate the variability of the sample mean when the population standard deviation is unknown and the sample size is small, and is used in hypothesis testing and confidence interval estimation.