

**WORKSHEET - 9 STATISTICS**

**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
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
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

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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.
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 ,  $s = 3$
  - b.  $\bar{x} = 19$  s ,  $s = 4$
  - c.  $\bar{x} = 17$  s ,  $s = 7$**
  - d.  $\bar{x} = 18$  s ,  $s = 6$
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  $H_0$
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.

**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

**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

**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

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

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

**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** - The T distribution, also known as the Student's t-distribution, is a type of probability distribution that is similar to the normal distribution with its bell shape but has heavier tails. T distributions have a greater chance for extreme values than normal distributions, hence the fatter tails.

**Z Distribution** – It is 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

**14.** Is the T distribution normal?

**Answer:** The T distribution is a family of distributions that look almost identical to the normal distribution curve, only a bit shorter and fatter. The t distribution is used instead of the normal distribution when you have small samples. The larger the sample size, the more the t distribution looks like the normal distribution. In fact, for sample sizes larger than 20 (e.g. more degrees of freedom), the distribution is almost exactly like the normal distribution.

**15.** What does the T distribution tell us?

**Answer:** The t distribution is a probability distribution that is used to estimate population parameters when the sample size is small and/or when the population variance is unknown.