

# STATISTICS WORKSHEET-9

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: b. 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.  $\bar{x} = 23$  s, = 3

b.  $\bar{x} = 19$  s, = 4

c.  $\bar{x} = 17$  s, = 7

d.  $\bar{x} = 18$  s, = 6

**Ans: c.  $\bar{x} = 17$  s, = 7**

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  $H_0$

**Ans: 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.

**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?

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  $H_a: \mu < \mu_0$ ?

- 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: 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

**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?

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

**Ans: b. 0.375**

13. What is T distribution and Z distribution?

**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. The t-distribution forms a bell curve when plotted on a graph. It can be described mathematically using the mean and the standard deviation.

**Z distribution**, also called the standard normal distribution, used for larger sample sizes, where the variance in the data is known.

14. Is the T distribution normal?

T distribution is a type of normal distribution that is used for smaller sample sizes. Data distributed normally form a bell shape when plotted on a graph, with more observations near the mean and fewer observations in the tails. It is a more conservative form of the standard normal distribution. This means that it gives a lower probability to the center and a higher probability to the tails than the standard normal distribution.

15. What does the T distribution tell us?

T-distribution, like the normal distribution, is bell-shaped and symmetric, but it has heavier tails, which means that it tends to produce values that fall far from its mean. Tail heaviness is determined by a parameter of the t-distribution called degrees of freedom, with smaller values giving heavier tails, and with higher values making the t-distribution resemble a standard normal distribution with a mean of 0 and a standard deviation of 1.