

## **STATISTICS WORKSHEET-10**

**Q1 to Q12 have only one correct answer. Choose the correct option to answer your question.**

1. Rejection of the null hypothesis is a conclusive proof that the alternative hypothesis is  
Answer-a) True
2. Parametric test, unlike the non-parametric tests, make certain assumptions about  
Answer-a) The population size
3. The level of significance can be viewed as the amount of risk that an analyst will accept when making a decision  
Answer-a. True
4. By taking a level of significance of 5% it is the same as saying  
Answer-c. We are 95% confident that the results have occurred by chance
5. One or two tail test will determine  
Answer-b. If the hypothesis has one or possible two conclusions.
6. Two types of errors associated with hypothesis testing are Type I and Type II. Type II error is committed when  
Answer-a. We reject the null hypothesis whilst the alternative hypothesis is true
7. A randomly selected sample of 1,000 college students was asked whether they had ever used the drug Ecstasy. Sixteen percent (16% or 0.16) of the 1,000 students surveyed said they had. Which one of the following statements about the number 0.16 is correct?  
Answer-a. It is a sample proportion
8. In a random sample of 1000 students,  $\hat{p} = 0.80$  (or 80%) were in favour of longer hours at the school library. The standard error of  $\hat{p}$  (the sample proportion) is  
Answer- a. .013

9. For a random sample of 9 women, the average resting pulse rate is  $\bar{x} = 76$  beats per minute, and the sample standard deviation is  $s = 5$ . The standard error of the sample mean is

Answer-c. 1.667

10. Assume the cholesterol levels in a certain population have mean  $\mu = 200$  and standard deviation  $\sigma = 24$ . The cholesterol levels for a random sample of  $n = 9$  individuals are measured and the sample mean  $\bar{x}$  is determined. What is the z-score for a sample mean  $\bar{x} = 180$ ?

Answer-c. -2.50

11. In a past General Social Survey, a random sample of men and women answered the question "Are you a member of any sports clubs?" Based on the sample data, 95% confidence intervals for the population proportion who would answer "yes" are .13 to .19 for women and .247 to .33 for men. Based on these results, you can reasonably conclude that

Answer-C. There is a difference between the proportions of American men and American women who belong to sports clubs.

12. Suppose a 95% confidence interval for the proportion of Americans who exercise regularly is 0.29 to 0.37. Which one of the following statements is FALSE?

Answer-b. It is reasonable to say that more than 40% of Americans exercise regularly.

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

13. How do you find the test statistic for two samples?

Answer-The test statistic for a two-sample independent  $t$ -test is calculated by taking the difference in the two sample means and dividing by either the pooled or unpooled estimated standard error. The estimated standard error is an aggregate measure of the amount of variation in both groups.

14. How do you find the sample mean difference?

- Answer-The **expected value** of the difference between all possible sample means is equal to the difference between population means. Thus,

$$E(x_1 - x_2) = \mu_d = \mu_1 - \mu_2.$$

- The standard deviation of the difference between sample means ( $\sigma_d$ ) is approximately equal to:

$$\sigma_d = \text{sqrt}( \sigma_1^2 / n_1 + \sigma_2^2 / n_2 )$$

It is straightforward to derive the last bullet point, based on material covered in previous lessons. The derivation starts with a recognition that the variance of the difference between independent random variables is equal to the sum of the individual variances. Thus,

$$\sigma_d^2 = \sigma^2_{(x_1 - x_2)} = \sigma^2_{x_1} + \sigma^2_{x_2}$$

If the populations  $N_1$  and  $N_2$  are both large relative to  $n_1$  and  $n_2$ , respectively, then

$$\sigma^2_{x_1} = \sigma^2_1 / n_1$$

$$\sigma^2_{x_2} = \sigma^2_2 / n_2$$

$$\sigma_d^2 = \sigma_1^2 / n_1 + \sigma_2^2 / n_2$$

$$\sigma_d = \text{sqrt}( \sigma_1^2 / n_1 + \sigma_2^2 / n_2 )$$

15. What is a two sample t test example?

Answer- The 2-sample t-test takes your sample data from two groups and boils it down to the t-value. The process is very similar to the 1-sample t-test, and you can still use the analogy of the signal-to-noise ratio. Unlike the paired t-test, the 2-sample t-test requires independent groups for each sample.

The formula is below, and then some discussion.

$$t = \frac{(\bar{X}_1 - \bar{X}_2)}{s}$$

For the 2-sample t-test, the numerator is again the signal, which is the difference between the means of the two samples. For example, if the mean of group 1 is 10, and the mean of group 2 is 4, the difference is 6.

