**Task Session 4**

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**1)**

t =

t = =5.59

Using a t-distribution table with 49 degrees of freedom (n-1), and a significance level of 0.05, we find the critical value to be 1.677.

Since our calculated t-value of 5.59 is greater than the critical value of 1.677, we reject the null hypothesis and conclude that there is sufficient evidence to suggest that the population mean interval between oil changes exceeds 3,000 miles at a significance level of 0.05.

2)

H0: μ = 1.88

Ha: μ > 1.88

t = (sample mean - hypothesized population mean) / (sample standard deviation / sqrt(sample size))

t = (2.09 - 1.88) / (0.13 / sqrt(45))

t = 5.92

Next, we will find the p-value associated with this test statistic using a t-distribution table with degrees of freedom equal to n-1 = 44:

p-value = P(t > 5.92) = 0.00000014

Finally, we will compare the p-value to our level of significance, α = 0.10. Since the p-value is much smaller than α, we reject the null hypothesis and conclude that there is sufficient evidence to support the claim that the actual mean turn-around time for performance of a battery of tests on blood samples is larger than 1.88 business days.

3)

We will perform a one-sample t-test to determine if the sample mean of 2.17 is significantly different from the claimed population mean of 2.

Our null hypothesis is that the population mean is equal to 2, and our alternative hypothesis is that the population mean is greater than 2.

H0: μ = 2

Ha: μ > 2

t = (sample mean - hypothesized population mean) / (sample standard deviation / sqrt(sample size))

t = (2.17 - 2) / (0.46 / sqrt(30))

t = 2.23

Next, we will find the p-value associated with this test statistic using a t-distribution table with degrees of freedom equal to n-1 = 29:

p-value = P(t > 2.23) = 0.017

4)

H0: μ = $61,500

Ha: μ < $61,500

We will use a t-test because the population standard deviation is unknown and we have a sample size of 40, which is large enough for the central limit theorem to apply.

t = (sample mean - hypothesized population mean) / (sample standard deviation / sqrt(sample size))

t = ($59,800 - $61,500) / ($5,850 / sqrt(40))

t = -2.32

Next, we will find the p-value associated with this test statistic using a t-distribution table with degrees of freedom equal to n-1 = 39:

p-value = P(t < -2.32) = 0.013

7)

* Correlation tests: measure the strength and direction of the relationship between two variables (e.g. Pearson correlation coefficient).
* T-tests: compare the means of two groups (e.g. independent t-test, paired t-test, one sample t-test).
* ANOVA: compare the means of more than two groups (e.g. one-way ANOVA, two-way ANOVA).
* F-test: compare the variances of two groups (e.g. to test the assumption of homogeneity of variance for ANOVA).
* Z-test: compare the means of a sample and a population or two populations (e.g. to test the hypothesis of a proportion).

8)

Cohen’s D, or **standardized mean difference**, is one of the most common ways to measure effect size. An effect size is how large an effect is. For example, medication A has a larger effect than medication B. While a p-value can tell you if there is an effect, it won’t tell you how large that effect is.

9)

[**Statistical power is a measure of the likelihood that a study will detect an effect when there is an effect to be detected**](https://www.bing.com/ck/a?!&&p=fe8ed7a6995dd0caJmltdHM9MTcwMDUyNDgwMCZpZ3VpZD0zMThhMzNlNi0zYWRkLTYzZWYtMmZkNi0yMGU5M2JhMTYyYjgmaW5zaWQ9NTgxOA&ptn=3&ver=2&hsh=3&fclid=318a33e6-3add-63ef-2fd6-20e93ba162b8&psq=+What+is+meant+by+statistical+power+and+how+we+use+it+%3f&u=a1aHR0cHM6Ly93d3cuYmFjaGVsb3JwcmludC5ldS9zdGF0aXN0aWNzL3N0YXRpc3RpY2FsLXBvd2VyLw&ntb=1)**.**[**It is a function of the sample size, the effect size, and the significance level of the test**](https://www.bing.com/ck/a?!&&p=e0e205864bdf6888JmltdHM9MTcwMDUyNDgwMCZpZ3VpZD0zMThhMzNlNi0zYWRkLTYzZWYtMmZkNi0yMGU5M2JhMTYyYjgmaW5zaWQ9NTgyNA&ptn=3&ver=2&hsh=3&fclid=318a33e6-3add-63ef-2fd6-20e93ba162b8&psq=+What+is+meant+by+statistical+power+and+how+we+use+it+%3f&u=a1aHR0cHM6Ly9xdWFudGlmeWluZ2hlYWx0aC5jb20vc3RhdGlzdGljYWwtcG93ZXIv&ntb=1)**.**[**Statistical power helps researchers to avoid Type II errors, or false negatives, and to estimate the efficiency and robustness of their study**](https://www.bing.com/ck/a?!&&p=8c6b2e476e39d1abJmltdHM9MTcwMDUyNDgwMCZpZ3VpZD0zMThhMzNlNi0zYWRkLTYzZWYtMmZkNi0yMGU5M2JhMTYyYjgmaW5zaWQ9NTgyNg&ptn=3&ver=2&hsh=3&fclid=318a33e6-3add-63ef-2fd6-20e93ba162b8&psq=+What+is+meant+by+statistical+power+and+how+we+use+it+%3f&u=a1aHR0cHM6Ly93d3cuYmFjaGVsb3JwcmludC5ldS9zdGF0aXN0aWNzL3N0YXRpc3RpY2FsLXBvd2VyLw&ntb=1)