Assignment Dated on 25.05.2023

Q1: - The Average Weight of all residents in a town is 168pounds. Nutrition believes the true mean to be different. She measured the true mean to be different. She measured the weight of 36 individuals and found the mean to be 169.5 pounds with a standard deviation of 3.6.

a. State the null and alternative Hypothesis.
b. At 95% CI, is there enough evidence to discard the null Hypothesis?

Sol: - Given;

- ✓ Sample Size (N) = 36
- ✓ Population Mean (μ) = 168
- ✓ Sample Mean ($\bar{x}$) = 169.9
- ✓ Sample Standard Deviation (S) = 3.6

a. Null Hypothesis; $H_o = The\ Average\ Weight\ of\ all\ the\ students\ in\ a\ town\ is\ 168pounds$
Alternative Hypothesis; $H_1 \neq The\ Average\ Weight\ of\ all\ the\ students\ in\ a\ town\ is\ 168pounds$ (Two Tiles Test)
$H_1 > The\ Average\ Weight\ of\ all\ the\ students\ in\ a\ town\ is\ 168pounds$ (Right Tiled Test)

b. α = 1 – CI = 1- .95 = .05

Upper Whisker = $\bar{x} + \frac{Z_\alpha}{2}\left(\frac{s}{\sqrt{n}}\right)$

= 169.5 + $Z_{0.025}\left(\frac{3.6}{\sqrt{36}}\right)$
= 169.5 + (1.96)(0.6)
= 169.5 + 1.176
=170.676

Lower Whisker = $\bar{x} - \frac{Z_\alpha}{2}\left(\frac{s}{\sqrt{n}}\right)$
= 169.5 - 1.176
=168.324

Test Statistic = $\frac{\bar{x}-\mu}{\frac{s}{\sqrt{n}}} = \frac{169.5-168}{0.6} = \frac{1.5}{0.6} = 2.5$

Upper Whisker = 170.676
Lower Whisker = 168.324
As 2.5 > 1.96, we have reject the null hypothesis.

Q2: - A Company manufactures bikes with an average life span of 2 years or more. An engineer believes this value to be less. Using 10 samples, he measures the average life span to be 1.8years with a standard deviation at 0.15.

a. State Null and Alternative Hypothesis
b. 99% CI, is there enough evidence to discard the null Hypothesis.

Sol:-
Given: -

- ✓ Sample Mean($\bar{x}$) = 1.8
- ✓ Z is the Z-score corresponding to the desired confidence level (99%)

- ✓ σ is the population standard deviation (0.15)
- ✓ n is the sample size (10)
- ✓ Degrees of Freedom (df) = n-1 = 10 – 1 =9

a. Null hypothesis (H_o): The average life span of the bike engine is 2 years or more.
Alternative hypothesis (H_1): The average life span of the bike engine is less than 2 years.

b. Calculating 99% CI, We need to determine the critical value for one tailed test (left tailed) with significance value of 0.01.

Checking the critical value at df 9 and significance value of 0.01 = - 2.821 (Left Tailed Test)

Let's calculate Marginal Error;
Upper Whisker = Sample Mead +Critical Value * (SD/$\sqrt{n}$) = (-2.821) * (0.15/$\sqrt{10}$)
= 1.8 + (-2.821)*(0.0474) =
= 1.8 - 0.134 = 1.67

Lower Whisker = Sample Mead +Critical Value * (SD/$\sqrt{n}$) = (-2.821) * (0.15/$\sqrt{10}$)
= 1.8 - (-2.821)*(0.0474) =
= 1.8 + 0.134 = 1.93

Test Statistic = $\frac{\bar{x}-\mu}{\frac{\sigma}{\sqrt{n}}} = \frac{1.8-2}{.047} = \frac{0.2}{0.047} = 4.25$

4.25 > (-2.821), we have to reject the null