PW-Skills

DA Session 10 – Hypothesis Testing Assignment

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T-Table Reference (Used Throughout the Assignment)

(Students' t-distribution critical values are used for hypothesis testing at given significance levels and degrees of freedom.)

Question 1

Problem Statement:

A company introduces a new customer feedback process. The mean satisfaction score before implementation was 72. After implementation, a random sample of 30 customers reported a mean score of 78 with a standard deviation of 10. At the 5% significance level, test whether the new process has improved customer satisfaction.

Solution:

Step 1: Hypotheses
H_0: $\mu = 72$
H_1: $\mu > 72$

Step 2: T-Table Critical Value
At $\alpha = 0.05$ and df = 29, the corresponding t-critical value is 1.699.

Step 3: Test Statistic
Calculated t-value = 3.2863.

Step 4: Comparison
Since the calculated t-value (3.2863) exceeds the critical value (1.699), the null hypothesis falls in the rejection region.

Step 5: Conclusion
There is sufficient statistical evidence to conclude that the new feedback process has significantly improved customer satisfaction.

Question 2

Problem Statement:

A school claims that its students score higher than the national average of 75. A random sample of 50 students has a mean score of 77 with a standard deviation of 8. Test the claim at the 1% significance level.

Solution:

Step 1: Hypotheses
H_0: $\mu = 75$
H_1: $\mu > 75$

Step 2: T-Table Critical Value
At $\alpha = 0.01$ and df = 49, the corresponding t-critical value is 2.405.

Step 3: Test Statistic
Calculated t-value = 1.7678.

Step 4: Comparison
The calculated t-value (1.7678) is less than the critical value (2.405), so it does not lie in the rejection region.

Step 5: Conclusion
At the 1% level of significance, there is insufficient evidence to support the claim that the school's average score is higher than the national average.

Question 3

Problem Statement:

A retail store wants to determine whether a new sales strategy increases average daily sales beyond ₹10,000. After 15 days, the average sales were ₹11,200 with a standard deviation of ₹1,500. Conduct the test at a 5% significance level.

Solution:

Step 1: Hypotheses
H_0: $\mu = 10{,}000$
H_1: $\mu > 10{,}000$

Step 2: T-Table Critical Value
At $\alpha = 0.05$ and df = 14, the corresponding t-critical value is 1.761.

Step 3: Test Statistic
Calculated t-value = 3.0984.

Step 4: Comparison
Since the calculated t-value (3.0984) is greater than the critical value (1.761), the null hypothesis is rejected.

Step 5: Conclusion
The data provides sufficient evidence that the new sales strategy increased average daily sales.

Question 4

Problem Statement:

A factory advertises that its light bulbs last an average of 1200 hours. A sample of 40 bulbs shows a mean lifespan of 1180 hours with a standard deviation of 50 hours. Test whether the advertised claim is accurate at the 5% significance level.

Solution:

Step 1: Hypotheses
H_0: $\mu = 1200$
H_1: $\mu \neq 1200$

Step 2: T-Table Critical Value
At $\alpha = 0.05$ and df = 39, the corresponding t-critical value is 2.023.

Step 3: Test Statistic
Calculated t-value = −2.5298.

Step 4: Comparison
The absolute calculated t-value (2.5298) exceeds the critical value (2.023), placing the result in the rejection region.

Step 5: Conclusion
There is sufficient statistical evidence to conclude that the advertised lifespan is not accurate.

Question 5

Problem Statement:

A researcher wants to test whether the average height of adult males in a city differs from the national average of 5.8 feet. A sample of 25 individuals has a mean height of 5.7 feet with a standard deviation of 0.3 feet. Perform the test at the 1% significance level.

Solution:

Step 1: Hypotheses
H_0: $\mu = 5.8$
H_1: $\mu \neq 5.8$

Step 2: T-Table Critical Value
At $\alpha = 0.01$ and df = 24, the corresponding t-critical value is 2.797.

Step 3: Test Statistic
Calculated t-value = −1.6667.

Step 4: Comparison
The absolute calculated t-value (1.6667) is less than the critical value (2.797), so the null hypothesis cannot be rejected.

Step 5: Conclusion
At the 1% level of significance, there is no evidence of a significant difference in average height.

Submitted by:
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