EXPERIMENT NO : 13

Hypothetical using T-Test

Aim:

To test whether the average IQ score of a sample of students differs significantly from a population mean IQ score of 100.

Algorithm:

- Null Hypothesis (H_o): The average IQ score of the sample is 100.
- Alternative Hypothesis (H_1): The average IQ score of the sample is not 100.
- Sample: Measure the IQ scores of 25 randomly selected students.
- T-Test: Conduct a one-sample T-test to compare the sample mean to 100.
- Decision Rule: Use a significance level of $\alpha = 0.05$.

Code:

```
import numpy as np
import scipy.stats as stats

np.random.seed(42)

sample_size = 25
sample_data = np.random.normal(loc=102, scale=15, size=sample_size)

population_mean = 100

sample_mean = np.mean(sample_data)
sample_std = np.std(sample_data, ddof=1)

n = len(sample_data)

t_statistic, p_value = stats.ttest_1samp(sample_data, population_mean)

print(f"Sample Mean: {sample_mean:.2f}")
print(f"T-Statistic: {t_statistic:.4f}")
print(f"P-Value: {p_value:.4f}")

alpha = 0.05
if p_value < alpha:
    print("Reject the null hypothesis: The average IQ score is significantly different from 100.")
else:
    print("Fail to reject the null hypothesis: There is no significant difference in average IQ score from 100.")
```

```
Sample Mean: 99.55
T-Statistic: -0.1577
P-Value: 0.8760
Fail to reject the null hypothesis: There is no significant difference in average IQ score from 100.
```

Result:

The test shows **no significant difference** between the sample mean IQ and the population mean of 100.

Hence, we **fail to reject the null hypothesis**.