EXPERIMENT NO: 12

Hypothetical using Z-Test

Aim:

To test whether the sample mean IQ differs significantly from the population mean (100) using a one-sample t-test.

Algorithm:

- Generate a random sample from a normal distribution (mean = 102, std = 15).
- Calculate the **sample mean** and **sample standard deviation**.
- Perform a **one-sample t-test** comparing the sample mean to the population mean (100).
- Compare the **p-value** with the significance level (α = 0.05).
- If $p < \alpha$, reject the null hypothesis; otherwise, fail to reject it.

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}")
```

```
Sample Mean: 99.55
```

```
print(f"T-Statistic: {t_statistic:.4f}")
```

```
T-Statistic: -0.1577
```

```
print(f"P-Value: {p_value:.4f}")
```

```
P-Value: 0.8760
```

```
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.")
```

```
Fail to reject the null hypothesis: There is no significant difference in average IQ score from 100.
```

Result:

The test shows that the sample's average IQ score is not significantly different from the population mean of 100. Hence, we fail to reject the null hypothesis.