Experiment No:12

Hypothetical using Z-Test

AIM:

To test whether the average weight of a species of birds differs from 150 grams.

ALGORITHM:

1. Import necessary libraries (NumPy, SciPy).
2. Define the sample data and population mean (150 grams).
3. Calculate sample mean and standard deviation.
4. Compute Z-statistic using the formula.
5. Find the p-value for the two-tailed test.
6. Compare p-value with $\alpha = 0.05$ to accept or reject H_0.
7. Display results and conclusion.

PROGRAM:

[7]:
```
import numpy as np
import scipy.stats as stats
```

[9]:
```
sample_data = np.array([
    152, 148, 151, 149, 147, 153, 150, 148, 152,
    149, 151, 150, 149, 152, 151, 148, 150, 152,
    149, 150, 148, 153, 151, 150, 149, 152, 148,
    151, 150, 153
])
```

[10]:
```
population_mean = 150
sample_mean = np.mean(sample_data)
sample_std = np.std(sample_data, ddof=1)  # sample standard deviation
n = len(sample_data)
```

[11]:
```
z_statistic = (sample_mean - population_mean) / (sample_std / np.sqrt(n))
p_value = 2 * (1 - stats.norm.cdf(np.abs(z_statistic)))  # two-tailed test
alpha = 0.05
```

[12]:
```
print(f"Sample Mean: {sample_mean:.2f}")
print(f"Z-Statistic: {z_statistic:.4f}")
print(f"P-Value: {p_value:.4f}")

if p_value < alpha:
    print("Reject the null hypothesis: The average weight is significantly different from 150 grams.")
else:
    print("Fail to reject the null hypothesis: There is no significant difference in average weight from 150 grams.")
```

```
Sample Mean: 150.20
Z-Statistic: 0.6406
P-Value: 0.5218
Fail to reject the null hypothesis: There is no significant difference in average weight from 150 grams.
```

RESULT:

Thus, the Python code to test whether the average weight of a species of birds differs from 150 grams using the Z-Test has been successfully executed.