

In [5]:

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

# Define the sample data (hypothetical weights in grams)
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
])

# Population mean under the null hypothesis
population_mean = 150

# Calculate sample statistics
sample_mean = np.mean(sample_data)
sample_std = np.std(sample_data, ddof=1) # sample std deviation
n = len(sample_data)

# Calculate the Z-statistic
z_statistic = (sample_mean - population_mean) / (sample_std / np.sqrt(n))

# Calculate the p-value (two-tailed)
p_value = 2 * (1 - stats.norm.cdf(np.abs(z_statistic)))

# Print results
print(f"Sample Mean: {sample_mean:.2f}")
print(f"Z-Statistic: {z_statistic:.4f}")
print(f"P-Value: {p_value:.4f}")

# Decision rule
alpha = 0.05
if p_value < alpha:
    print("Reject H0: The average weight is significantly different from 150g.")
else:
    print("Fail to reject H0: No significant difference from 150g.")
```

Sample Mean: 150.20
Z-Statistic: 0.6406
P-Value: 0.5218
Fail to reject H₀: No significant difference from 150g.