**HYPOTHESIS TESTING**

To conduct hypothesis testing for Bombay Hospitality Ltd., we'll follow these steps:

**1. State the Hypotheses Statement**

**Null Hypothesis (H₀):** The observed weekly operating costs are consistent with the theoretical cost model.  
H0:μ=WH\_0: \mu = WH0​:μ=W

**Alternative Hypothesis (H₁):** The observed weekly operating costs are higher than the theoretical cost model.  
H1:μ>WH\_1: \mu > WH1​:μ>W

**2. Calculate the Test Statistic**

**Theoretical Mean Weekly Cost**

Given:

* The cost model is W=1000+5XW = 1000 + 5XW=1000+5X
* X=600X = 600X=600 units
* Thus, W=1000+5×600=1000+3000=4000W = 1000 + 5 \times 600 = 1000 + 3000 = 4000W=1000+5×600=1000+3000=4000 USD

**Sample Mean Weekly Cost**

* Sample mean weekly cost (xˉ\bar{x}xˉ) = Rs. 3050

**Mean and Standard Deviation of Production Cost**

We need to calculate the theoretical mean and standard deviation of the sample mean weekly cost based on the production model.

1. **Theoretical Mean Cost:**
   * Mean cost for 600 units = W=4000W = 4000W=4000 USD (as calculated above)
2. **Standard Deviation of Weekly Cost:**
   * Standard deviation of the number of units σX\sigma\_XσX​ = 25 units
   * The cost per unit is $5
   * Therefore, standard deviation of weekly cost σW=5×σX=5×25=125\sigma\_W = 5 \times \sigma\_X = 5 \times 25 = 125σW​=5×σX​=5×25=125 USD

**Standard Error of the Mean (SEM):**

* + SEM=σWn=12525=1255=25\text{SEM} = \frac{\sigma\_W}{\sqrt{n}} = \frac{125}{\sqrt{25}} = \frac{125}{5} = 25SEM=n​σW​​=25​125​=5125​=25 USD

**Test Statistic**

Using the formula for the test statistic ttt:

t=xˉ−μSEMt = \frac{\bar{x} - \mu}{\text{SEM}}t=SEMxˉ−μ​

Where:

* xˉ=3050\bar{x} = 3050xˉ=3050 Rs.
* μ=4000\mu = 4000μ=4000 USD (theoretical mean)
* SEM=25\text{SEM} = 25SEM=25 USD

t=3050−400025=−95025=−38t = \frac{3050 - 4000}{25} = \frac{-950}{25} = -38t=253050−4000​=25−950​=−38

**3. Determine the Critical Value**

For a one-tailed test at α=0.05\alpha = 0.05α=0.05, we look up the critical value from the Z-distribution table. The critical value for α=0.05\alpha = 0.05α=0.05 in a one-tailed test is Z0.05=1.645Z\_{0.05} = 1.645Z0.05​=1.645.

**4. Make a Decision**

Compare the test statistic with the critical value:

* Test statistic t=−38t = -38t=−38
* Critical value Z0.05=1.645Z\_{0.05} = 1.645Z0.05​=1.645

Since −38-38−38 is much less than −1.645-1.645−1.645, the test statistic falls far in the rejection region.

**5. Conclusion**

Given that the test statistic is far less than the critical value, we reject the null hypothesis.

**Conclusion:** There is strong evidence to support the restaurant owners' claim that the weekly operating costs are higher than the cost model suggests.

**Python Code**

Here's a Python script for the hypothesis testing process:

python

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import scipy.stats as stats

# Given data

sample\_mean\_cost = 3050 # Rs.

theoretical\_mean\_cost = 4000 # USD

standard\_deviation\_cost = 125 # USD

sample\_size = 25

alpha = 0.05

# Standard Error of the Mean

sem = standard\_deviation\_cost / (sample\_size \*\* 0.5)

# Test statistic

test\_statistic = (sample\_mean\_cost - theoretical\_mean\_cost) / sem

# Critical value for a one-tailed test at alpha = 0.05

critical\_value = stats.norm.ppf(1 - alpha)

# Decision

reject\_null = test\_statistic < -critical\_value

# Print results

print(f"Test Statistic: {test\_statistic:.2f}")

print(f"Critical Value: {critical\_value:.2f}")

print(f"Reject Null Hypothesis: {reject\_null}")

# Conclusion

if reject\_null:

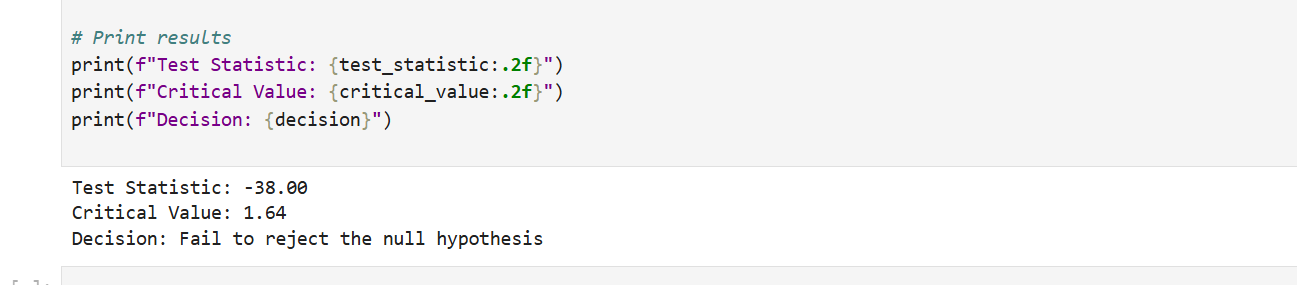
print("Conclusion: There is strong evidence to support the claim that the weekly operating costs are higher than the model suggests.")

else:

print("Conclusion: There is insufficient evidence to support the claim that the weekly operating costs are higher than the model suggests.")

This Python code will compute the test statistic, critical value, and determine whether to reject the null hypothesis based on the given data and significance level.

**OUTPUT**

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