Sri Lanka Institute of Information Technology

Lab Submission
Lab sheet No 10

IT24100416

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Probability and Statistics | IT2120

B.Sc. (Hons) in Information Technology

Exercise

1. A vending machine owner claims that customers choose the four snack types (A, B, C, D) with equal probability. To test this claim, a researcher records the number of purchases for each snack type during one week and results are given below.

Snack_Type	Count
A	120
B	95
C	85
D	100

i. State the null and alternative hypotheses for the test.

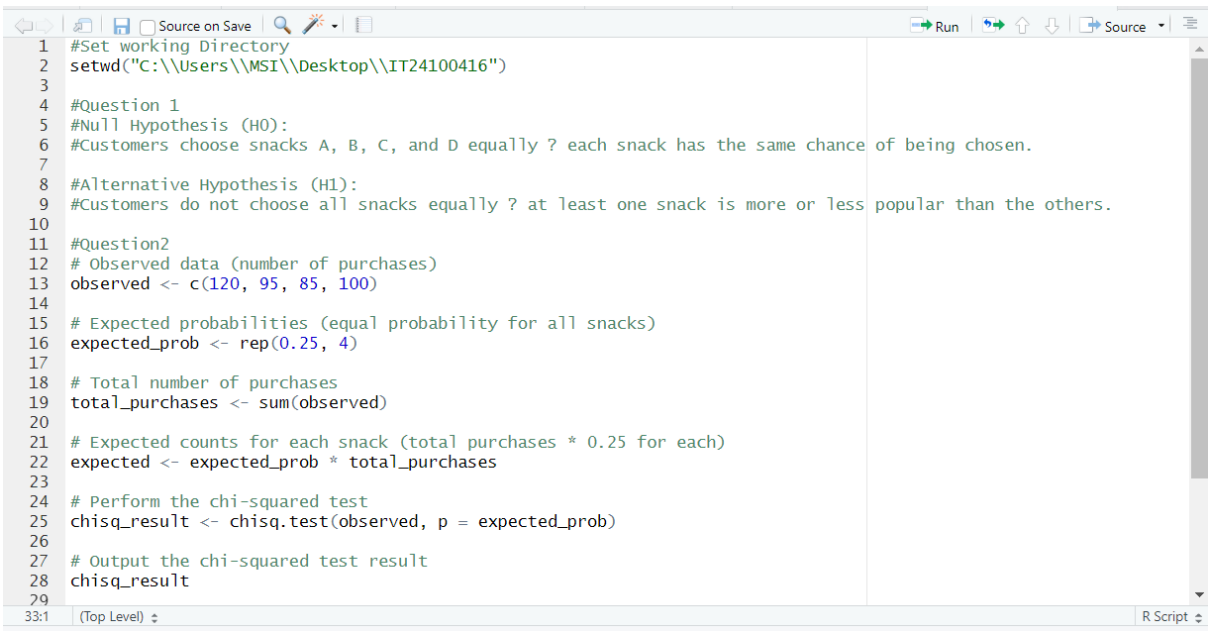
Null Hypothesis (H_0):

- The vending machine owner claims that customers choose each of the four snack types (A, B, C, D) with equal probability. Therefore, the null hypothesis is:
    - The probability of choosing snack A = The probability of choosing snack B = The probability of choosing snack C = The probability of choosing snack D = 0.25 (equal probability for all snack types).

Alternative Hypothesis (H_1):

- The alternative hypothesis is that the probabilities of selecting each snack type are not equal (i.e., at least one snack type is chosen with a different probability than the others).

ii. Perform a suitable chi-squared test to test the null hypothesis.



Console | Terminal | Background Jobs

R 4.5.1 · C:/Users/MSI/Desktop/IT24100416/

```
> #Set working Directory
> setwd("C:\\Users\\MSI\\Desktop\\IT24100416")
> #Question2
> # Observed data (number of purchases)
> observed <- c(120, 95, 85, 100)
> # Expected probabilities (equal probability for all snacks)
> expected_prob <- rep(0.25, 4)
> # Total number of purchases
> total_purchases <- sum(observed)
> # Expected counts for each snack (total purchases * 0.25 for each)
> expected <- expected_prob * total_purchases
> # Perform the chi-squared test
> chisq_result <- chisq.test(observed, p = expected_prob)
> # Output the chi-squared test result
> chisq_result

        Chi-squared test for given probabilities

data:  observed
X-squared = 6.5, df = 3, p-value = 0.08966
```

R | Global Environment

Data	
chisq_result	List of 9
Values	
expected	num [1:4] 100 100 100 100
expected_prob	num [1:4] 0.25 0.25 0.25 0.25
observed	num [1:4] 120 95 85 100
total_purchases	400

iii. Give your conclusions based on the results.

Since the p-value (0.08966) is greater than 0.05, we fail to reject the null hypothesis at the 5% level of significance.

This means there is not enough statistical evidence to conclude that customers prefer some snack types over others. Therefore, we accept the vending machine owner's claim that customers choose the four snack types (A, B, C, D) with equal probability.