

IT2120 – Probability and Statistics

IT24103555

Senan R.A.D.T

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.

```
RStudio
File Edit Code View Plots Session Build Debug Profile Tools Help
Go to file/function Addins
Untitled1*
1 setwd("C:\\Users\\USER\\Desktop\\IT24103555(4)")
2
3 #Part 1
4 #Here, the vending machine owner claims that customers choose the four snack types (A, B, C, D) with equal probability.
5 #That means the probability for each snack type would be 0.25.
6 #So the null hypothesis will be: the probability for each snack type is 0.25.
7 #The alternative hypothesis will be: at least one snack type has a probability different from 0.25.
8

> setwd("C:\\Users\\USER\\Desktop\\IT24103555(4)")
> #Part 1
> #Here, the vending machine owner claims that customers choose the four snack types (A, B, C, D) with equal probability.
> #That means the probability for each snack type would be 0.25.
> #So the null hypothesis will be: the probability for each snack type is 0.25.
> #The alternative hypothesis will be: at least one snack type has a probability different from 0.25.
> #Part 2
```

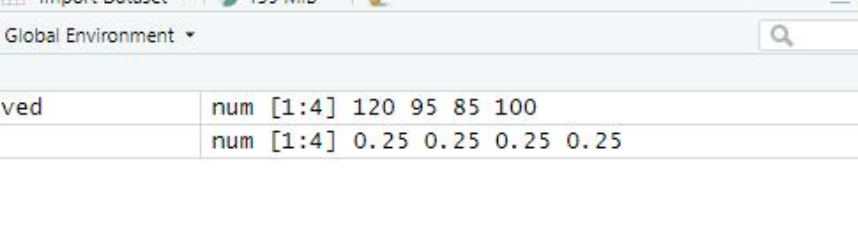
ii. Perform a suitable chi-squared test to test the null hypothesis.

```
9 #Part 2
10 #To conduct the test, observed counts will be stored in a variable called "observed"
11 #And probabilities for each snack type will be stored in a variable called "prob"
12 observed <- c(120, 95, 85, 100)
13 prob <- c(0.25, 0.25, 0.25, 0.25)
14 #To conduct the test, the "chisq.test" command will be used as follows:
15 chisq.test(x = observed, p = prob)
16

> #Part 2
> #To conduct the test, observed counts will be stored in a variable called "observed"
> #And probabilities for each snack type will be stored in a variable called "prob"
> observed <- c(120, 95, 85, 100)
> prob <- c(0.25, 0.25, 0.25, 0.25)
> #To conduct the test, the "chisq.test" command will be used as follows:
> chisq.test(x = observed, p = prob)

Chi-squared test for given probabilities

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



The screenshot shows the RStudio Environment pane. At the top, there are tabs for 'Environment', 'History', 'Connections', and 'Tutorial'. Below the tabs, there is a toolbar with icons for 'Import Dataset', '159 MiB', and a 'List' button. The main area of the pane is titled 'values' and contains a table with two rows: 'observed' and 'prob'. The 'observed' row has values 120, 95, 85, and 100, and the 'prob' row has values 0.25, 0.25, 0.25, and 0.25. The data is stored in a numeric vector of length 4.

	num [1:4]
observed	120 95 85 100
prob	0.25 0.25 0.25 0.25

iii. Give your conclusions based on the results.

```
17 # Part 3
18 # Consider 5% level of significance for the test.
19 # Rejection Region: If the p-value for the test is less than 0.05,
20 # reject the null hypothesis at 5% level of significance.
21 # p-value for the test is 0.08966.
22 # Conclusion: Since the p-value (0.08966) is greater than 0.05,
23 # do not reject the null hypothesis at 5% level of significance.
24 # Therefore, we can conclude that the probability for each snack type is the same (0.25).
```

```
> # Part 3
> # Consider 5% level of significance for the test.
> # Rejection Region: If the p-value for the test is less than 0.05,
> # reject the null hypothesis at 5% level of significance.
> # P-value for the test is 0.08966.
> # Conclusion: Since the p-value (0.08966) is greater than 0.05,
> # do not reject the null hypothesis at 5% level of significance.
> # Therefore, we can conclude that the probability for each snack type is the same (0.25).
```