

Sri Lanka Institute of Information Technology



Lab Submission
Lab sheet No 10

IT24101836

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Probability and Statistics | IT2120

B.Sc. (Hons) in Information Technology

```
IT24100036 Lab 10.R x
Source on Save
1 setwd("C:\\IT24101982 Lab 10")
2 getwd()
3 observed <- c(A=120, B=95, C=85, D=100)
4 # 1) State the hypotheses
5 cat("1) Hypotheses:\n")
6 cat("H0: customers choose A, B, C, D equally (p_A = p_B = p_C = p_D = 0.25)\n")
7 cat("H1: The choice probabilities are not all equal (some p_i != 0.25)\n")
8
9 # 1i) Apply chi-square goodness-of-fit test
10 total <- sum(observed)
11 expected <- rep(total / 4, 4)
12
13 cat("observed counts:\n"); print(observed)
14 cat("expected counts under H0 (each = total/4):\n"); print(expected); cat("\n")
15
16 # Use built-in chi-square test
17 chisq_test <- chisq.test(x = observed, p = rep(0.25,4))
18
19 # Display test output
20 cat("1i) Chi-square test result (chisq.test):\n")
21 print(chisq_test)
22 cat("\n")
23
24 # Manual calculation (same result)
25 chisq_manual <- sum((observed - expected)^2 / expected)
26 df <- length(observed) - 1
27 p_value_manual <- pchisq(chisq_manual, df = df, lower.tail = FALSE)
28
29 cat("Manual chi-square calculation:\n")
30 cat(sprintf("Chi-square = %.4f, df = %d, p-value = %.4f\n", chisq_manual, df, p_value_manual))
31
32 # 1ii) Conclusion for results
33
34 # At the 5% significance level ( $\alpha = 0.05$ ), the p-value is greater than 0.05, so we do not have enough evidence to reject the null hypothesis.
35 # This means the data do not show a significant difference from equal snack preference - customers appear to choose A, B, C, and D roughly equally.
36 # However, at the 10% level ( $\alpha = 0.10$ ), the p-value is slightly smaller than 0.10, which suggests weak or marginal evidence that customers may prefer some snacks more than others.
```

```
Console Terminal Background Jobs x
R - R4.5.1 - C:\Users\Navindu Karunaratne\Desktop\IT23756564 Lab 10\
> observed <- c(A=120, B=95, C=85, D=100)
> # 1) State the hypotheses
> cat("1) Hypotheses:\n")
1) Hypotheses:
> cat("H0: Customers choose A, B, C, D equally (p_A = p_B = p_C = p_D = 0.25)\n")
H0: Customers choose A, B, C, D equally (p_A = p_B = p_C = p_D = 0.25)
> cat("H1: The choice probabilities are not all equal (some p_i != 0.25)\n")
H1: The choice probabilities are not all equal (some p_i != 0.25)
> # 1i) Apply chi-square goodness-of-fit test
> total <- sum(observed)
> expected <- rep(total / 4, 4)
>
> cat("observed counts:\n"); print(observed)
observed counts:
 A B C D
120 95 85 100
> cat("Expected counts under H0 (each = total/4):\n"); print(expected); cat("\n")
Expected counts under H0 (each = total/4):
[1] 100 100 100 100
>
> # Use built-in chi-square test
> chisq_test <- chisq.test(x = observed, p = rep(0.25,4))
>
> # Display test output
> cat("1i) Chi-square test result (chisq.test):\n")
1i) Chi-square test result (chisq.test):
> print(chisq_test)

Chi-squared test for given probabilities

data: observed
X-squared = 6.5, df = 3, p-value = 0.08966
> cat("\n")
>
> # Manual calculation (same result)
> chisq_manual <- sum((observed - expected)^2 / expected)
> df <- length(observed) - 1
> p_value_manual <- pchisq(chisq_manual, df = df, lower.tail = FALSE)
>
> cat("Manual chi-square calculation:\n")
Manual chi-square calculation:
> cat(sprintf("Chi-square = %.4f, df = %d, p-value = %.4f\n", chisq_manual, df, p_value_manual))
Chi-square = 6.5000, df = 3, p-value = 0.0897
>
>
> # 1ii) Conclusion for results
>
> # At the 5% significance level ( $\alpha = 0.05$ ), the p-value is greater than 0.05, so we do not have enough evidence to reject the null hypothesis.
> # This means the data do not show a significant difference from equal snack preference - customers appear to choose A, B, C, and D roughly equally.
> # However, at the 10% level ( $\alpha = 0.10$ ), the p-value is slightly smaller than 0.10, which suggests weak or marginal evidence that customers may prefer some snacks more than others.
>
```

EnvironmentHistoryConnectionsTutorial

Import Dataset

217 MiB

R

Global Environment

List

Data

chisq_test

List of 9

values

chisq_manual

6.5

df

3

expected

num [1:4] 100 100 100 100

observed

Named num [1:4] 120 95 85 100

p_value_manual

0.0896625039881679

total

400