Date 11/04/2024

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EXPERIMENT - 9

Aim :- Apply the procedures for testing hypothesis in R, including t-test, z-test, and chi-Square test, to analyze the significance of various scenarios.

Introduction :-

The aim of this experiment is to apply procedures for testing hypotheses in R, specially focusing on the t-test z-test, and Chi-Square test. The goal is to gain practical experiment in using these statistical tests to analyze the significance of various scenarios.

Software Required :-

1. R statistical Software
2. R studio.

Relevance of the Experiment :- Hypothesis testing is a fundamental aspect of statistical analysis, allowing researchers to make inferences about population parameters based on sample data. This experiment is relevant for individuals involved in data analysis, research and decision-making, as it provides hands-on experience in applying and interpreting hypothesis tests for different types of data.

Teacher's Signature:

Aim:- Apply the procedures for testing hypothesis in R, including t-test, z-test, and chi-square test, to analyze the significance of various scenarios.

```r
# Load necessary libraries
library(ggplot2)

# Scenario 1: t-test for comparing means
group1 <- c(25, 30, 28, 35, 32)
group2 <- c(20, 22, 18, 25, 28)

# Plot histograms
hist_data <- data.frame(
  value = c(group1, group2),
  group = rep(c("Group 1", "Group 2"), each = 5)
)

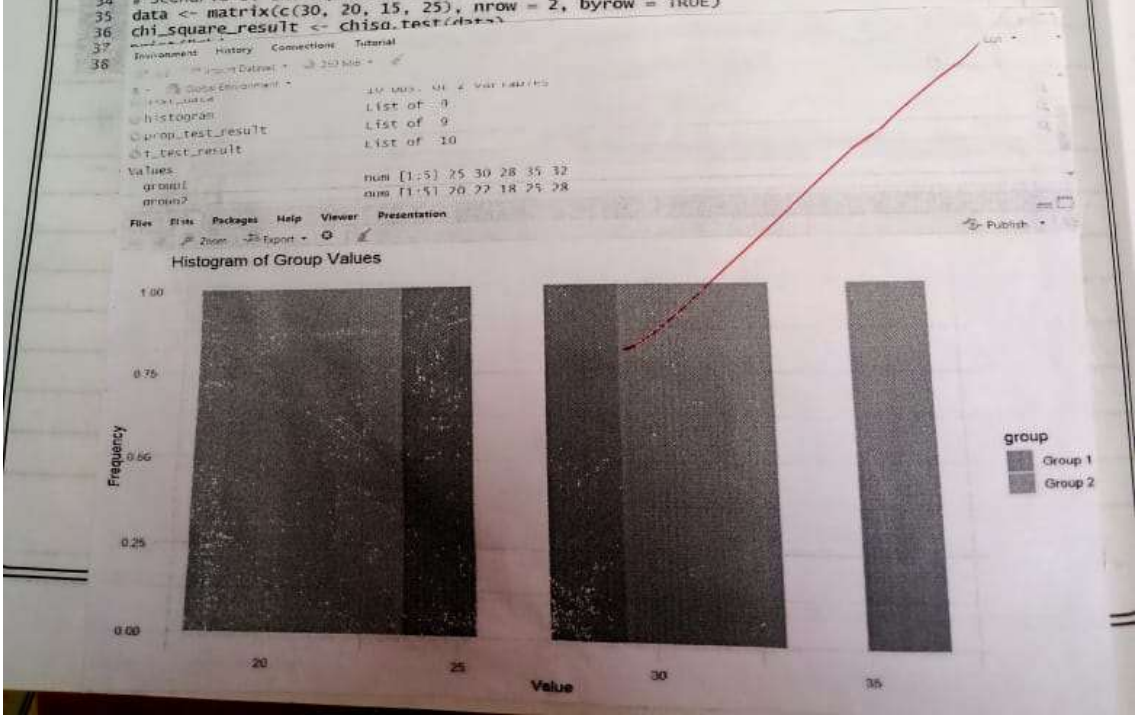
histogram <- ggplot(hist_data, aes(x = value, fill = group)) +
  geom_histogram(position = "identity", alpha = 0.5, bins = 10) +
  labs(title = "Histogram of Group Values", x = "Value", y = "Frequency") +
  scale_fill_manual(values = c("Group 1" = "blue", "Group 2" = "red")) +
  theme_minimal()

print(histogram)

# Perform t-test
t_test_result <- t.test(group1, group2)
print("T-Test Result:")
print(t_test_result)

# Scenario 2: Z-test for proportions
successes <- 20
total_trials <- 50
prop_test_result <- prop.test(successes, total_trials, alternative = "two.sided")
print("Proportion Test Result:")
print(prop_test_result)

# Scenario 3: Chi-Square test for independence
data <- matrix(c(30, 20, 15, 25), nrow = 2, byrow = TRUE)
chi_square_result <- chisq.test(data)
```



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Description :- The experiment involves applying hypothesis testing procedures to various scenarios using R. Participants will use the t-test for comparing means, the z-test for proportions, and the Chi-square test for independence. Scenarios may include comparing means of two groups, testing proportions, or assessing the independence of categorical variables. Emphasis will be placed on formulating null and alternative hypotheses, conducting the test, and interpreting the results.

Pseudocode / Algorithm :-

1. Select the appropriate hypothesis test based on the nature of the data.
2. Formulate the null & alternative hypothesis.
3. Conduct the hypothesis test using the relevant R functions.
4. Interpret the results and make conclusions based on the calculated p-value.
5. Repeat the process for different scenarios.

Learning Outcomes :-

1. Understanding the principles of hypothesis testing in statistics.

Teacher's Signature:

Console Terminal Background Jobs

R 4.2.2 · ~/

```
data:  group1 and group2
t = 3.006, df = 7.9853, p-value = 0.01695
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
  1.721475 13.078525
sample estimates:
mean of x mean of y
     30.0      22.6

>
> # Scenario 2: Z-test for proportions
> successes <- 20
> total_trials <- 50
> prop_test_result <- prop.test(successes, total_trials, alternative = "two.sided")
> print("Proportion Test Result:")
[1] "Proportion Test Result:"
> print(prop_test_result)

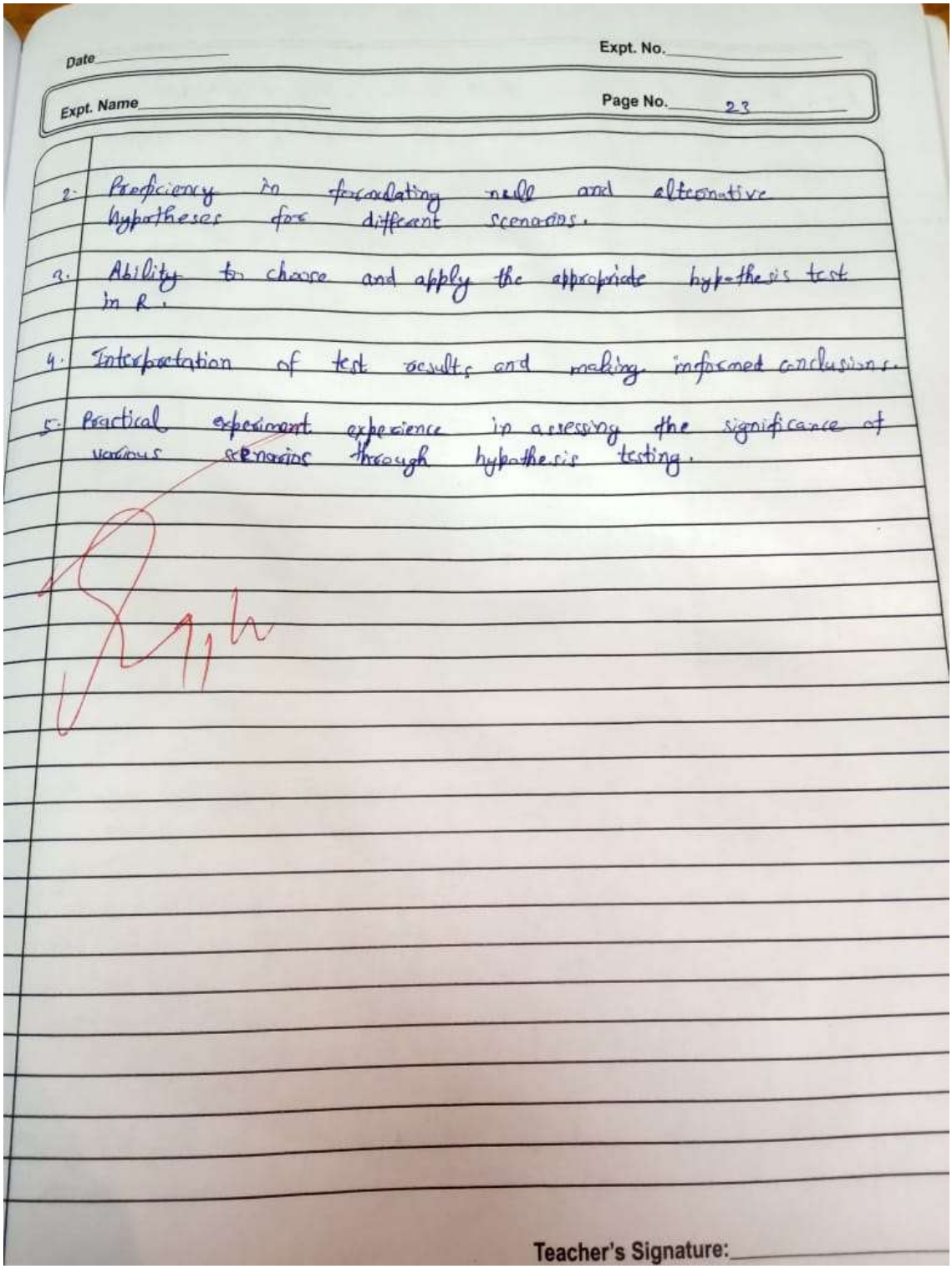
        1-sample proportions test with continuity correction

data:  successes out of total_trials, null probability 0.5
X-squared = 1.62, df = 1, p-value = 0.2031
alternative hypothesis: true p is not equal to 0.5
95 percent confidence interval:
 0.2673293 0.5479516
sample estimates:
  p
0.4

>
> # Scenario 3: Chi-Square test for independence
> data <- matrix(c(30, 20, 15, 25), nrow = 2, byrow = TRUE)
> chi_square_result <- chisq.test(data)
> print("Chi-Square Test Result:")
[1] "Chi-Square Test Result:"
> print(chi_square_result)

        Pearson's Chi-squared test with Yates' continuity correction

data:  data
X-squared = 3.645, df = 1, p-value = 0.05624
```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2. Proficiency in formulating null and alternative hypotheses for different scenarios.

3. Ability to choose and apply the appropriate hypothesis test in R.

4. Interpretation of test results and making informed conclusions.

5. Practical experiment experience in assessing the significance of various scenarios through hypothesis testing.

Teacher's Signature: _____

SCREENSHOTS:

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chi_square_result <- chisq.test(data)
print("Chi-Square Test Result:")
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```

Console | Terminal | Background Jobs

R 4.2.2 · ~/

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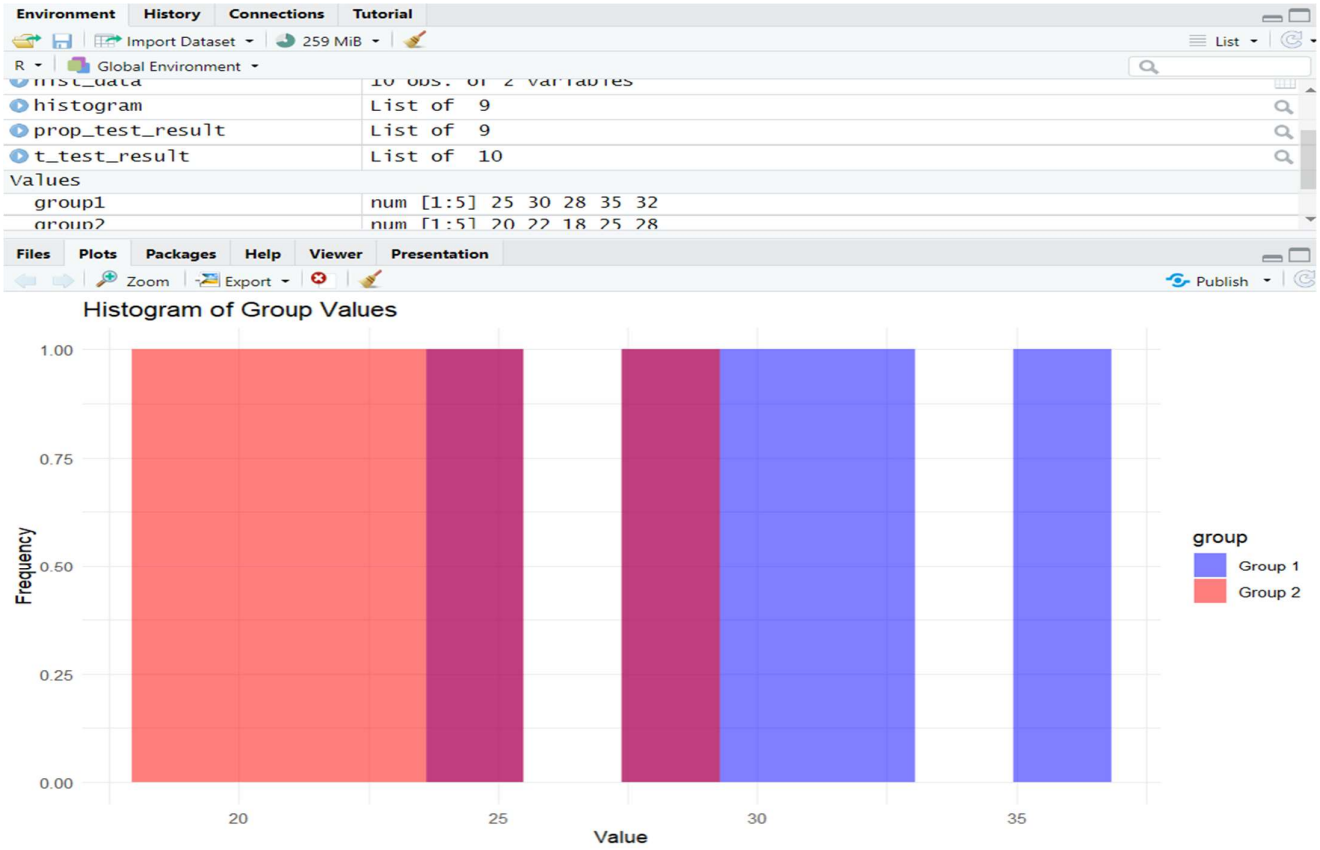
Environment
History
Connections
Tutorial
Import Dataset
259 MiB
List
R
Global Environment
hist_data
10 obs. of 2 variables
histogram
List of 9
prop_test_result
List of 9
t_test_result
List of 10
Values
group1
num [1:5] 25 30 28 35 32
group2
num [1:5] 20 22 18 25 28
Files
Plots
Packages
Help
Viewer
Presentation
Zoom
Export
Publish
Histogram of Group Values
Frequency
1.00
0.75
0.50
0.25
0.00
20
25
30
35
Value
group
Group 1
Group 2