Nagar Yuwak Shikshan Sanstha's
Yeshwantrao Chavan College of Engineering
(An Autonomous Institution affiliated to Rashtrasant Tukadoji Maharaj Nagpur University)
HingnaRoad,Wanadongri, Nagpur - 441110
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DepartmentofComputerTechnologyB.TechinComputerScienceandEngineering(IOT)

Visionofthe Department

To be a well-known centre for pursuing computer education through innovative pedagogy, value-based education and industry collaboration.

Mission of the Department

To establish learning ambience for ushering in computer engineering professionals in core and multidisciplinary area by developing Problem-solving skills through emerging technologies.

Session 2025-2026

Vision: Dream of Where you want	**Mission:** Means to achieve vision

Program Educational Objectives of the program (PEO): (broad statements that describe the professional and career accomplishments)

PEO1	**Preparation**	**P: Preparation**	**Pep-CL abbreviation pronounce as Pep-si-lL easy to recall**
PEO2 PEO3	**Core Competence Breadth**	**E: Environment (Learning Environment)**	
PEO4	**Professionalism**	**P: Professionalism**	
PEO5	**Learning**	**C: Core Competence**	
	Environment	**L: Breadth (Learning in diverse areas)**	

Program Outcomes (PO): (statements that describe what a student should be able to do and know by the end of a program) **Keywords of POs:**
Engineering knowledge, Problem analysis, Design/development of solutions, Conduct Investigations of Complex Problems, Engineering Tool Usage, The Engineer and The World, Ethics, Individual and Collaborative Team work, Communication, Project Management and Finance, Life-Long Learning

PSO Keywords: Cutting edge technologies, Research

"I am an engineer, and I know how to apply engineering knowledge to investigate, analyse and design solutions to complex problems using tools for entire world following all ethics in a collaborative way with proper management skills throughout my life." *to contribute to the development of cutting-edge technologies and Research*.

Integrity: I will adhere to the Laboratory Code of Conduct and ethics in its entirety.

Name and Signature of Student and Date
(Signature and Date in Handwritten)

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Session	2025-26(ODD)	Course Name	Lab : MFDA
Semester	5	Course Code	23IOT1526
RollNo	52	Name of Student	Parth Bhedurkar

Practical Number	7
Course Outcome	1. CO2: Apply statistical tests to analyze relationships between categorical variables. 2. CO3: Perform Chi-Square test to determine the independence or association between factors. 3. CO4: Interpret Chi-Square results to make meaningful conclusions from data.
Aim	To implement the Chi-square test.
Problem Definition	Conduct a Chi-square test of independence to determine whether success on math exam scores (yes, no) is related to gender (male, female).
Theory (100 words)	Sure here's the **theory for the Chi-Square Test of Independence** practical written in a clear and concise form suitable for your college practical file: **Theory:Chi-SquareTestof Independence** 1. The **Chi-SquareTest ofIndependence** is a statistical test used to determine whether there is a **significant association between two categorical variables**. In this practical, we check if **gender(male,female)** is related to **success in math exam (yes, no)**. 2. It compares the **observedfrequencies** (actual data) with the **expected frequencies** (values that would occur if there were no relationship between the variables). 3. The formula for the Chi-Square statistic is: [\chi^2 = \sum \frac{(O - E)^2}{E}] where o (O) = Observed frequency o (E) = Expected frequency

	4. The **degrees of freedom (df)** for the test are calculated as: [df = (r - 1) \times (c - 1)] where *r* = number of rows, *c* = number of columns. 5. The calculated Chi-Square value is then compared with the **critical value** from the Chi-Square distribution table at a chosen **significance level (usually 0.05)**. 6. **Decision Rule:** o If the calculated Chi-Square value > critical value → **Reject Null Hypothesis (H_0)** → There **is a relationship** between gender and exam success. o Otherwise → **Fail to Reject Null Hypothesis (H_0)** → There **is no relationship** between gender and exam success. 7. **Conclusion:** The Chi-Square Test helps determine if the two categorical variables — **gender** and **math exam success** — are **independent or associated**.
Procedure and Execution (100 Words)	1. Aim: Test whether exam success is independent of gender using Chi-Square test of independence. 2. Collect data: Record counts in a 2×2 contingency table (Gender × Success). 3. Build contingency table: Organize observed frequencies *Oij*in rows (Male, Female) and columns (Yes, No). 4. Compute row, column and grand totals. 5. Calculate expected frequencies for each cell: $Eij = \frac{(\text{row total}i)\times(\text{column total}j)}{\text{grand total}}$ (Check that no expected cell < 5; if many are <5, use Fisher's exact test.) 6. Compute Chi-square statistic: $\chi^2 = \sum \frac{(O_{ij} - E_{ij})^2}{Eij}$ 7. Degrees of freedom: $df = (r-1)(c-1)$. For 2×2, *df*=1. 8. Decision: Compare calculated $\chi^2$with critical value at chosen

α(commonly 0.05), or use p-value:

- If $\chi^2 > \chi^2_{crit}$ or $p < \alpha \rightarrow$ reject $H0$(variables are associated).
- Else $\rightarrow$ fail to reject H 0(no evidence of association).

9. Conclude and report results.

Code:

```
# Step 1: Create the contingency table
data <- matrix(c(35, 25, 20, 24),
               nrow = 2,
               byrow = TRUE)

# Add row and column names
rownames(data) <- c("Male", "Female")
colnames(data) <- c("Success_Yes", "Success_No")
# Display the contingency table
print("Contingency Table:")
print(data)
# Step 2: Perform Chi-square test
test_result <- chisq.test(data)
# Step 3: Display test results
print("Chi-square Test Result:")
print(test_result)
#Step 4 (Optional): Interpret result
if(test_result$p.value < 0.05) {



  cat("Conclusion: Reject the null hypothesis — Success on math exam is
related to gender.\n")
}else {
  cat("Conclusion: Fail to reject the null hypothesis — Success on math exam is
not related to gender.\n")
}
```

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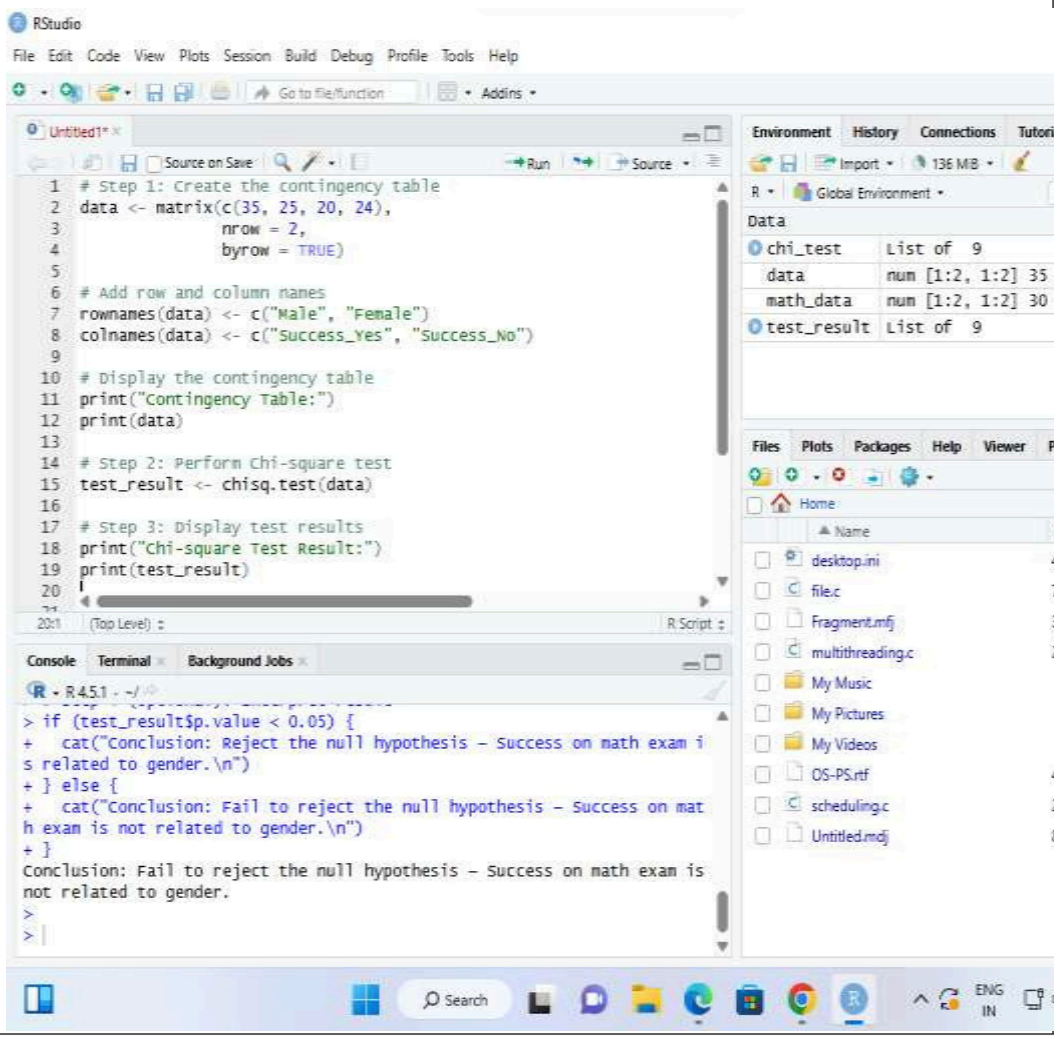
Output:



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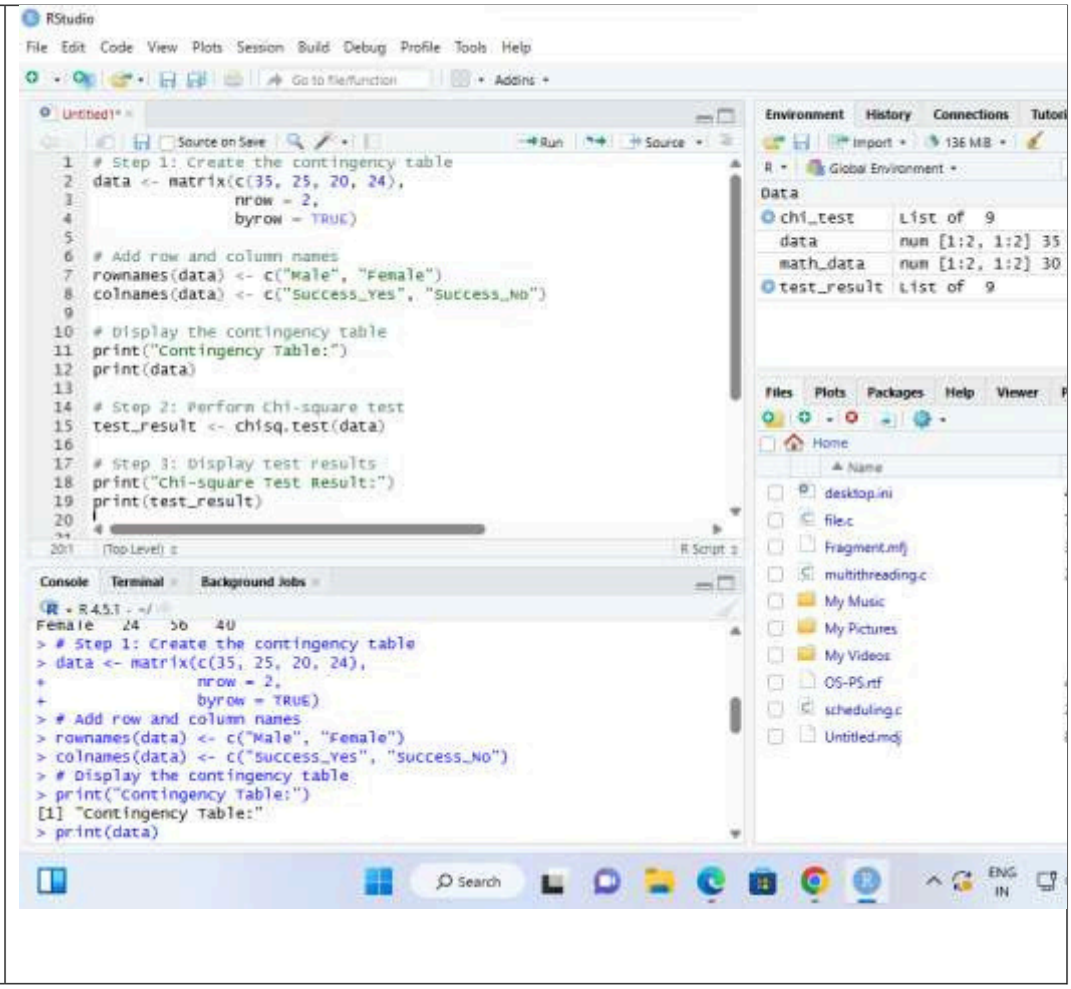

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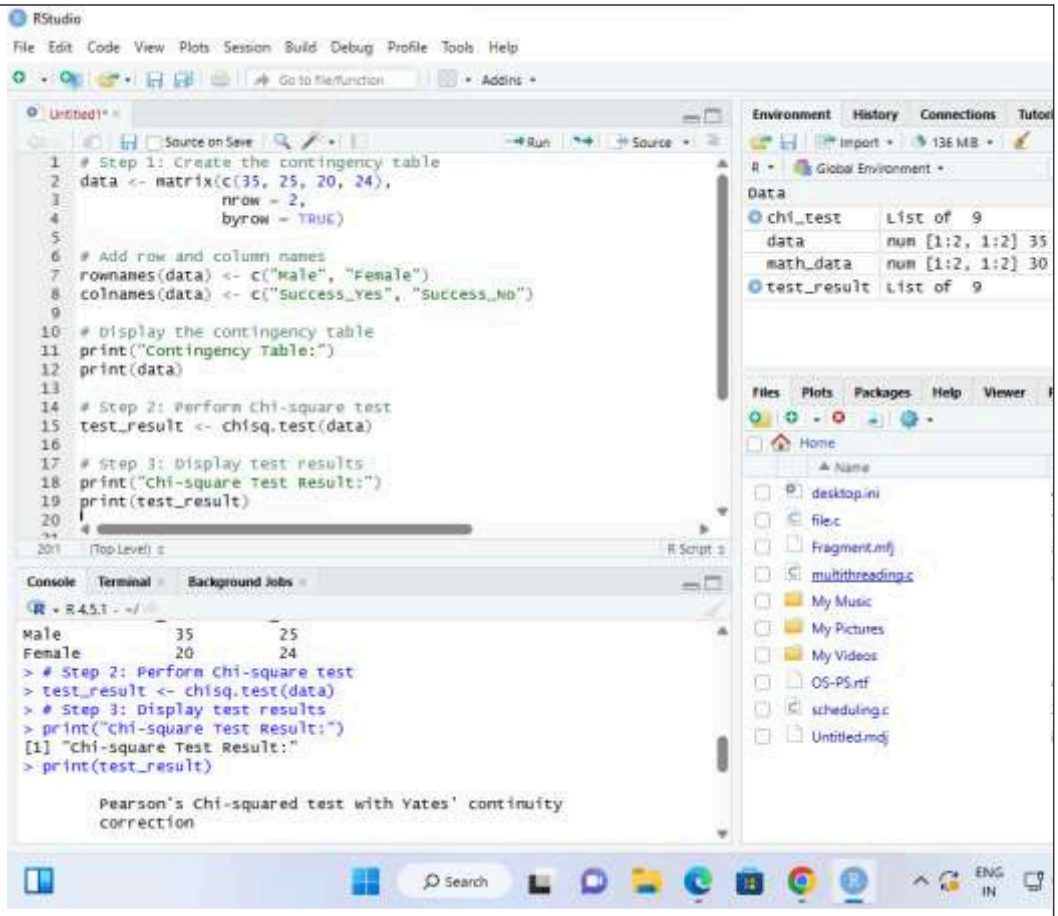

Output Analysis	1. The Chi-Square test was performed to determine if **gender** and **math exam success** are related. 2. The observed frequencies were entered in a 2×2 contingency table (Male/Female × Yes/No). 3. Expected frequencies were calculated based on row and column totals. 4. The calculated Chi-Square value (≈ 1.01) was **less than the critical value (3.841)** at a 5% significance level. 5. The **p-value (~0.31)** was greater than 0.05, indicating **no significant association**. 6. Hence, we **fail to reject the null hypothesis (H_o)** — success in math exams is **independent of gender**. 7. The test shows that **gender does not significantly affect exam performance** in the given sample.

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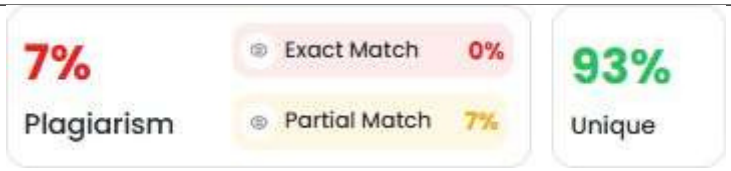
Link of student Github profile where lab assignment has been uploaded	https://github.com/parthbhedurkar
Conclusion	The Chi-Square test result shows that there is **no significant relationship** between gender and success in math exams. Hence, **exam performance is independent of gender** in the given data.
Plag Report (Similarity index < 12%)	
Date	03/11/2025