Programming for Data Science Lab Experiment-1

Experiment Title:

Billing System and Customer Behavior Analysis using Functions in R

Experiment Number:

Experiment 1

Duration:

100 minutes

Total Marks:

100

Instructor:

Dr.Trilok Nath Pandey

Experiment Details:

You are tasked with building a basic billing and analytics tool for a small local store. The store does not have access to databases or spreadsheets, so you are required to implement everything using R functions and vectors. Your goal is to simulate customer purchase data and compute key metrics such as total billing, popular items, and customer types without using any data frames or built-in visualization functions.

Instructions

- Do not use data.frame(), tibble(), or any other table-based structure.
- Use only vectors, lists, and user-defined functions.
- Use only base R, without any external libraries.
- Add clear comments in your code.
- All output must be printed using R functions like cat() or print().
- Write brief interpretations as part of your lab report.

Lab Tasks (Total: 100 Marks)

Part A: Data Simulation using Vectors (20 Marks)

1. Create the following vectors manually (with at least 10 values each): customer_names, customer_type ("Regular" or "New"), item_name, price_per_unit, quantity_purchased.
2. Write a user-defined function calculate_total_bill() that takes two vectors (price and quantity) and returns a vector of total bill values for each customer.

Part B: Summary Statistics using User defined Functions (25 Marks)

3. Write user-defined functions to compute and print:
- Total revenue
- Average bill amount
- Maximum and minimum bill amount
- Total number of "Regular" vs "New" customers

Part C: Custom Analytics (25 Marks)

4. Write a function get_high_spenders() that takes the total bill vector and customer names and returns names of customers who spent more than Rs. 500.
5. Write a function item_wise_quantity() that takes item_name and quantity_purchased as input and returns total quantity sold for each unique item.

Part D: Code Comments and Interpretation (30 Marks)

6. Comment every user-defined function with: purpose, input parameters, and output/return value.
7. Write short textual interpretations for the following (as part of your report):
- Which item was sold the most?
- Which customer type contributes more to the total revenue?

Rubric for Evaluation

Component	Marks
A. Vector Creation and Total Bill Function	20
B. Summary Statistics Functions	25
C. Analytics Functions	25
D. Code Comments & Interpretation	30
Total	100

Lab Report Submission Format

File Name Format: Experiment_1_YourName_RegistrationNumber.docx or .pdf

Example: Experiment_1_RaviKumar_25BDE1012.pdf

Lab Report Template

1. Objective:
To simulate and analyze customer billing data using only vectors and user-defined functions in R.

2. Methodology:
- Data created using individual vectors
- Billing computed using custom functions
- Summary and filtering logic implemented without data frames

3. R Code with Comments:
- All user-defined functions with inputs, outputs, and inline comments

4. Output Summary:
- Printed results: total revenue, average bill, customer type summary, high spenders, etc.

5. Interpretations:
- Which item was most sold?
- Which customer type generated more revenue?

6. Conclusion:
- Summarize what you learned from simulating a basic billing and analytics engine without data structures like data frames.