

Practice Assignment 1

Lab EDA

(Both Exp 1 and Exp 2 are here)



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BASIC DATA STRUCTURES

1. Vectors

Code :

```
print("21BDS0085 JVNGANESH")

#A1)

numeric_vector <- c(11, 32, 43, 64, 75)

print("Numeric Vector:")

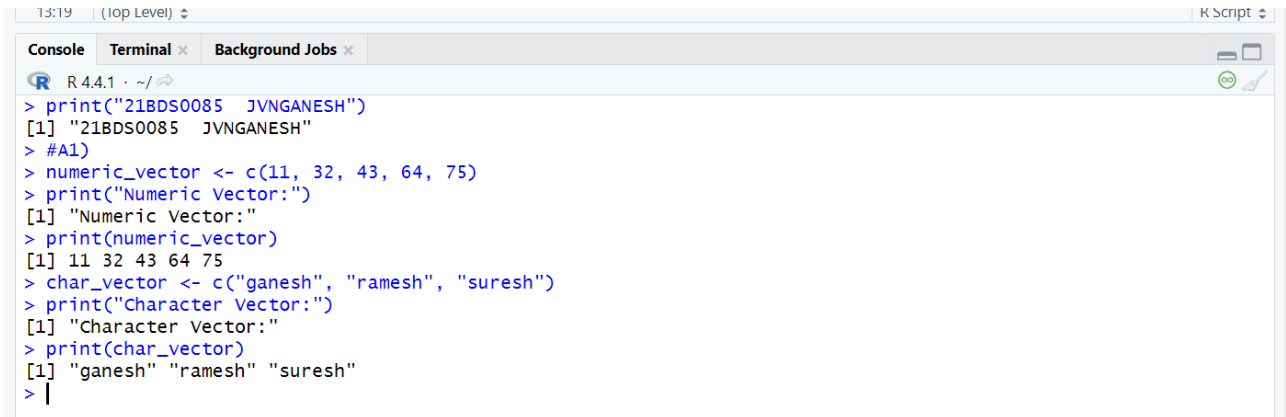
print(numeric_vector)

char_vector <- c("ganesh", "ramesh", "suresh")

print("Character Vector:")

print(char_vector)
```

Output:

A screenshot of an R console window. The window has a title bar with '13:19', '(top Level)', and 'R Script'. Below the title bar are three tabs: 'Console', 'Terminal', and 'Background Jobs'. The 'Console' tab is active, showing the R prompt and the following code and output:

```
> print("21BDS0085 JVNGANESH")
[1] "21BDS0085 JVNGANESH"
> #A1)
> numeric_vector <- c(11, 32, 43, 64, 75)
> print("Numeric Vector:")
[1] "Numeric Vector:"
> print(numeric_vector)
[1] 11 32 43 64 75
> char_vector <- c("ganesh", "ramesh", "suresh")
> print("Character Vector:")
[1] "Character Vector:"
> print(char_vector)
[1] "ganesh" "ramesh" "suresh"
> |
```

2. Matrices

Code:

```
print("21BDS0085 JVNGANESH")

#2

matrix_1 <- matrix(1:9, nrow = 3, ncol = 3)
```

```
print("Matrix 1:")
```

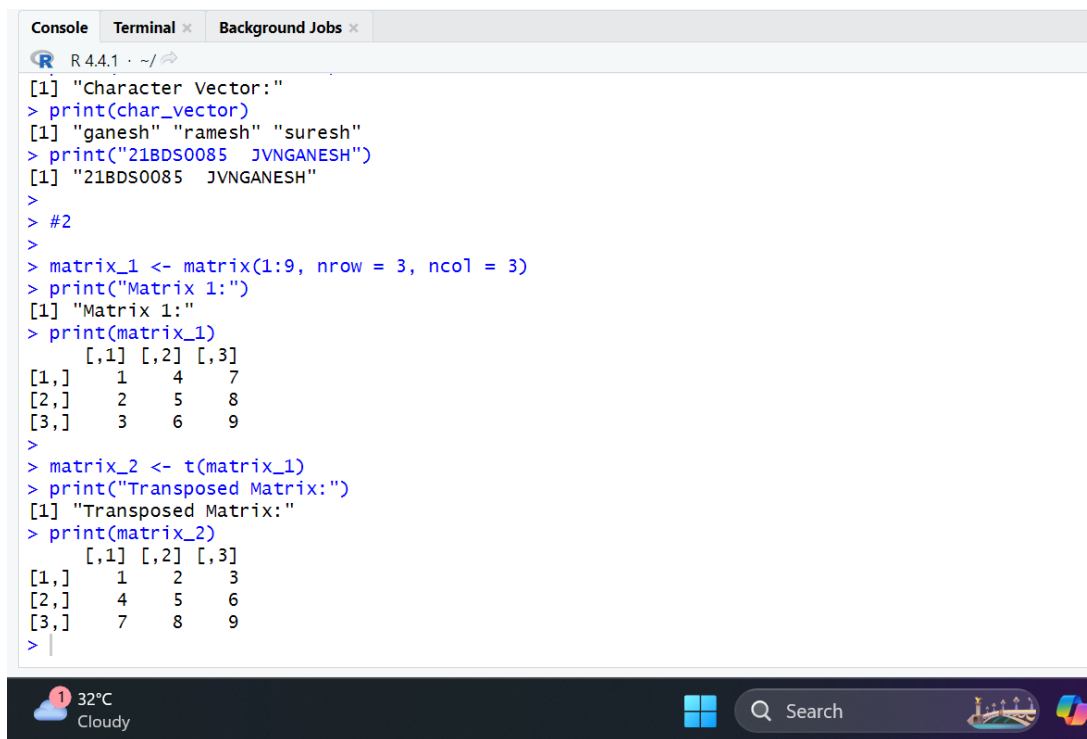
```
print(matrix_1)
```

```
matrix_2 <- t(matrix_1)
```

```
print("Transposed Matrix:")
```

```
print(matrix_2)
```

OUTPUT:



```
R 4.4.1 ~/  
[1] "Character Vector:"  
> print(char_vector)  
[1] "ganesh" "ramesh" "suresh"  
> print("21BDS0085 JVNGANESH")  
[1] "21BDS0085 JVNGANESH"  
>  
> #2  
>  
> matrix_1 <- matrix(1:9, nrow = 3, ncol = 3)  
> print("Matrix 1:")  
[1] "Matrix 1:"  
> print(matrix_1)  
      [,1] [,2] [,3]  
[1,]    1    4    7  
[2,]    2    5    8  
[3,]    3    6    9  
>  
> matrix_2 <- t(matrix_1)  
> print("Transposed Matrix:")  
[1] "Transposed Matrix:"  
> print(matrix_2)  
      [,1] [,2] [,3]  
[1,]    1    2    3  
[2,]    4    5    6  
[3,]    7    8    9  
>
```

3.ARRAYS

Code

```
print("21BDS0085 JVNGANESH")
```

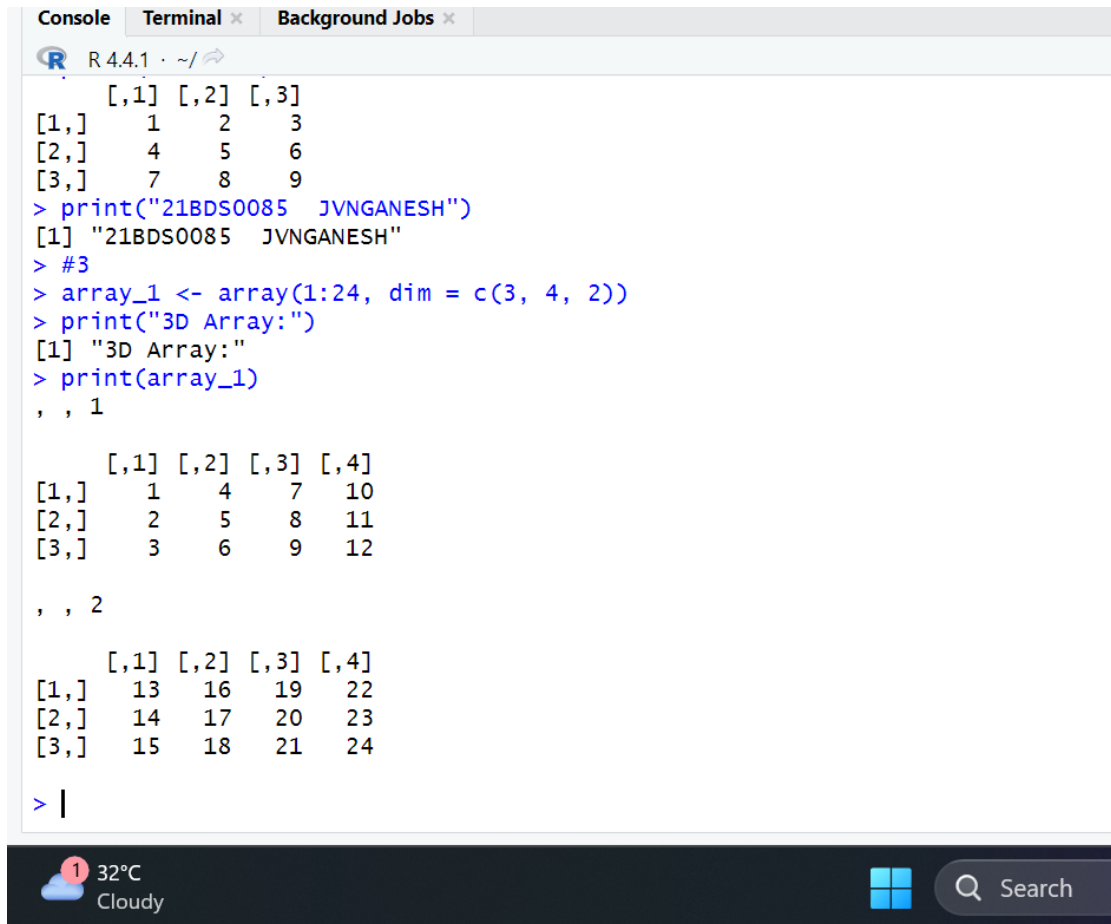
```
#3
```

```
array_1 <- array(1:24, dim = c(3, 4, 2))
```

```
print("3D Array:")
```

```
print(array_1)
```

Output



The screenshot shows an R console window with the following content:

```
R 4.4.1 · ~/
[1,] [1,] [2,] [3,]
[1,] 1 2 3
[2,] 4 5 6
[3,] 7 8 9
> print("21BDS0085 JVNGANESH")
[1] "21BDS0085 JVNGANESH"
> #3
> array_1 <- array(1:24, dim = c(3, 4, 2))
> print("3D Array:")
[1] "3D Array:"
> print(array_1)
, , 1

    [,1] [,2] [,3] [,4]
[1,] 1 4 7 10
[2,] 2 5 8 11
[3,] 3 6 9 12

, , 2

    [,1] [,2] [,3] [,4]
[1,] 13 16 19 22
[2,] 14 17 20 23
[3,] 15 18 21 24

> |
```

The bottom of the window shows a taskbar with a weather widget (32°C Cloudy), the Windows logo, and a search bar.

4.Lists

Code

```
print("21BDS0085 JVNGANESH")
```

```
#4
```

```
list_1 <- list(name = "Ganesh", age = 22, scores = c(85, 90, 95))
```

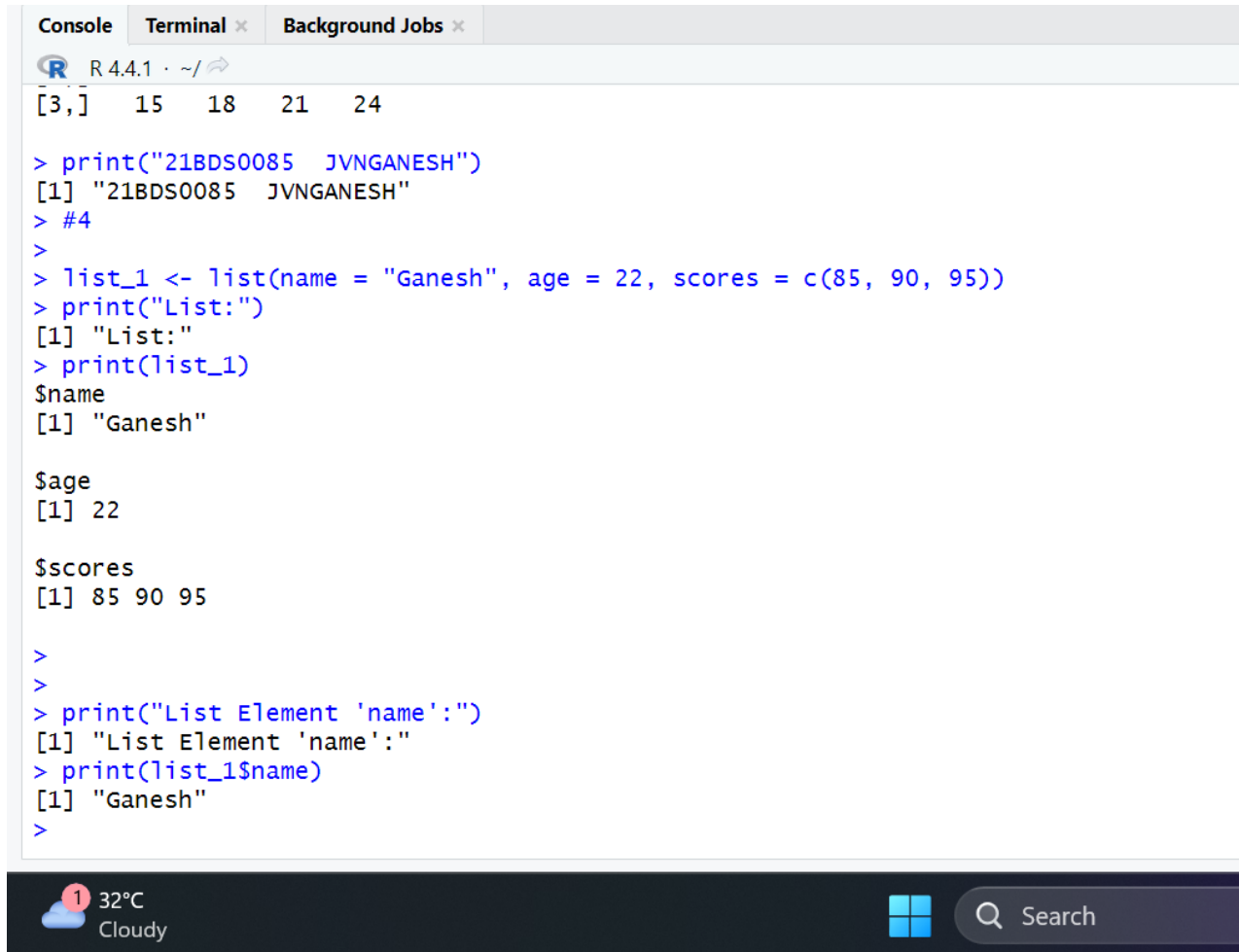
```
print("List:")
```

```
print(list_1)
```

```
print("List Element 'name':")
```

```
print(list_1$name)
```

Output



The screenshot shows an R console window with the following content:

```
Console Terminal x Background Jobs x
R 4.4.1 · ~/
[3,] 15 18 21 24

> print("21BDS0085 JVNGANESH")
[1] "21BDS0085 JVNGANESH"
> #4
>
> list_1 <- list(name = "Ganesh", age = 22, scores = c(85, 90, 95))
> print("List:")
[1] "List:"
> print(list_1)
$name
[1] "Ganesh"

$age
[1] 22

$scores
[1] 85 90 95

>
>
> print("List Element 'name':")
[1] "List Element 'name':"
> print(list_1$name)
[1] "Ganesh"
>
```

The bottom of the window shows a system tray with a weather icon (32°C Cloudy), a taskbar icon, and a search bar.

5. Data frames

Code

#5

```
print("21BDS0085 JVNGANESH")

data_frame_1 <- data.frame(

  Name = c("Pranay", "gary", "jayanth"),

  Age = c(28, 22, 35),

  Score = c(85, 90, 80)

)

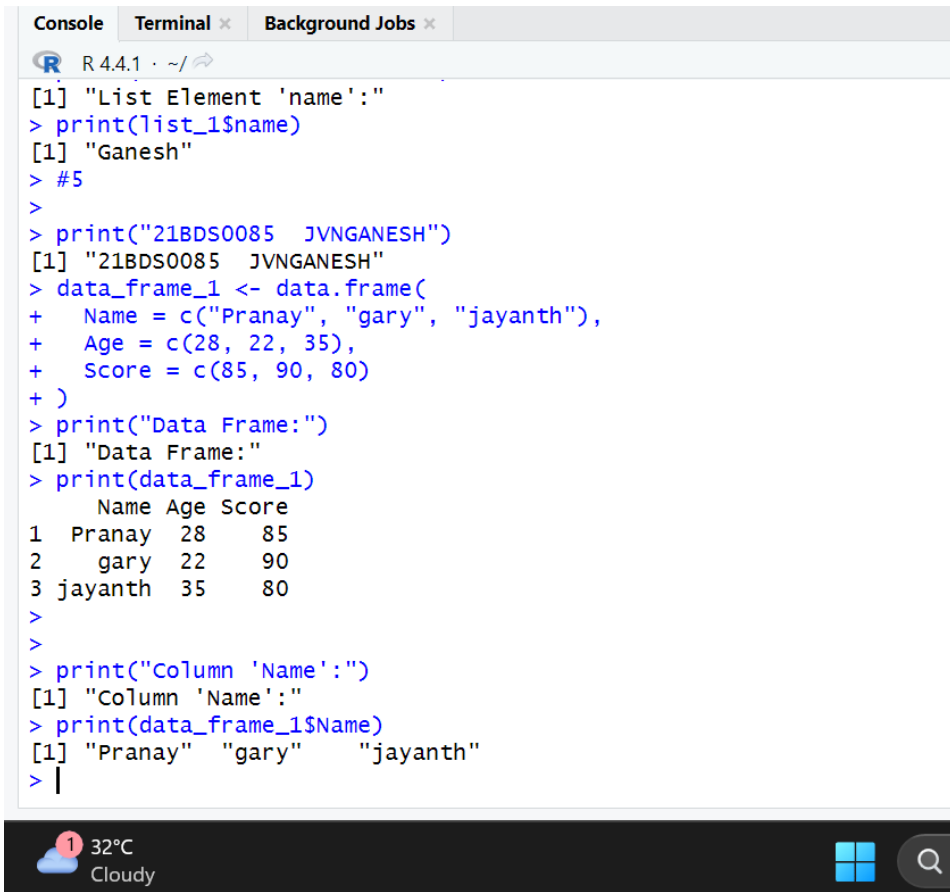
print("Data Frame:")

print(data_frame_1)
```

```
print("Column 'Name':")

print(data_frame_1$Name)
```

Output



The screenshot shows an R console window with the following code and output:

```
R 4.4.1 · ~/
[1] "List Element 'name':"
> print(list_1$name)
[1] "Ganesh"
> #5
>
> print("21BDS0085 JVNGANESH")
[1] "21BDS0085 JVNGANESH"
> data_frame_1 <- data.frame(
+   Name = c("Pranay", "gary", "jayanth"),
+   Age = c(28, 22, 35),
+   Score = c(85, 90, 80)
+ )
> print("Data Frame:")
[1] "Data Frame:"
> print(data_frame_1)
  Name Age Score
1 Pranay  28   85
2  gary  22   90
3 jayanth 35   80
>
>
> print("Column 'Name':")
[1] "Column 'Name':"
> print(data_frame_1$Name)
[1] "Pranay" "gary" "jayanth"
> |
```

The bottom of the window shows a system tray with a weather icon indicating 32°C and Cloudy, and a search icon.

6.Factors

Code

#6

```
print("21BDS0085 JVNGANESH")

factor_1 <- factor(c("low", "medium", "high", "medium", "low"))

print("Factor:")

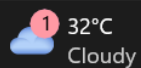
print(factor_1)


print("Levels:")

print(levels(factor_1))
```

Output:

```
> #6
>
> print("21BDS0085 JVNGANESH")
[1] "21BDS0085 JVNGANESH"
> factor_1 <- factor(c("low", "medium", "high", "medium", "low"))
> print("Factor:")
[1] "Factor:"
> print(factor_1)
[1] low      medium high      medium low
Levels: high low medium
>
>
> print("Levels:")
[1] "Levels:"
> print(levels(factor_1))
[1] "high" "low" "medium"
> |
```



7.Tables

Code

#7

```
print("21BDS0085 JVNGANESH")

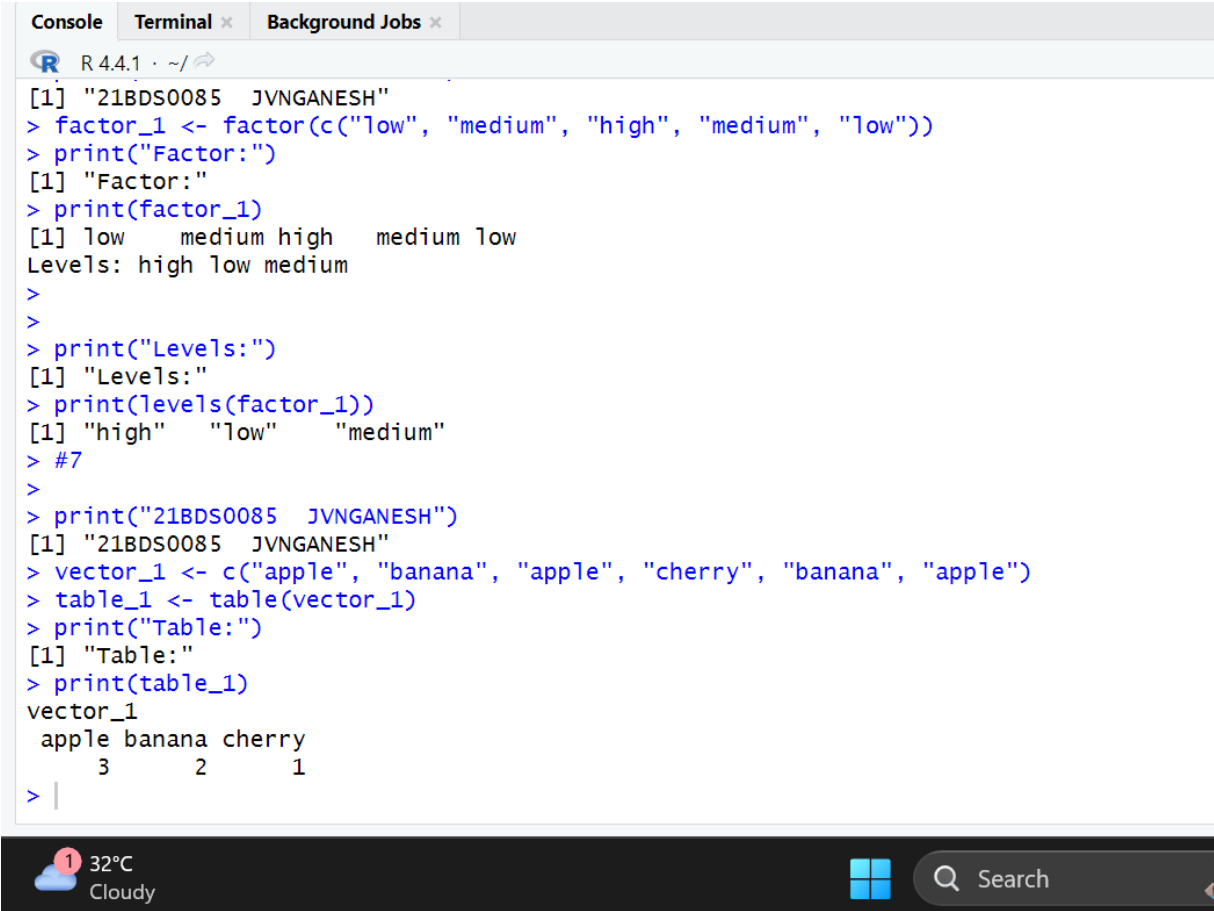
vector_1 <- c("apple", "banana", "apple", "cherry", "banana", "apple")

table_1 <- table(vector_1)

print("Table:")

print(table_1)
```

Output



The screenshot shows an R console window with the following content:

```
R 4.4.1 · ~/
[1] "21BDS0085 JVNGANESH"
> factor_1 <- factor(c("low", "medium", "high", "medium", "low"))
> print("Factor:")
[1] "Factor:"
> print(factor_1)
[1] low      medium high      medium low
Levels: high low medium
>
>
> print("Levels:")
[1] "Levels:"
> print(levels(factor_1))
[1] "high" "low" "medium"
> #7
>
> print("21BDS0085 JVNGANESH")
[1] "21BDS0085 JVNGANESH"
> vector_1 <- c("apple", "banana", "apple", "cherry", "banana", "apple")
> table_1 <- table(vector_1)
> print("Table:")
[1] "Table:"
> print(table_1)
vector_1
  apple banana cherry
      3       2       1
> |
```

At the bottom of the window, there is a system tray showing a temperature of 32°C, Cloudy weather, a Windows taskbar icon, and a search bar.

8. Lists with Different Types

Code

#8

```
print("21BDS0085 JVNGANESH")

complex_list <- list(

  vector = c(1, 2, 3),

  matrix = matrix(1:4, nrow = 2),

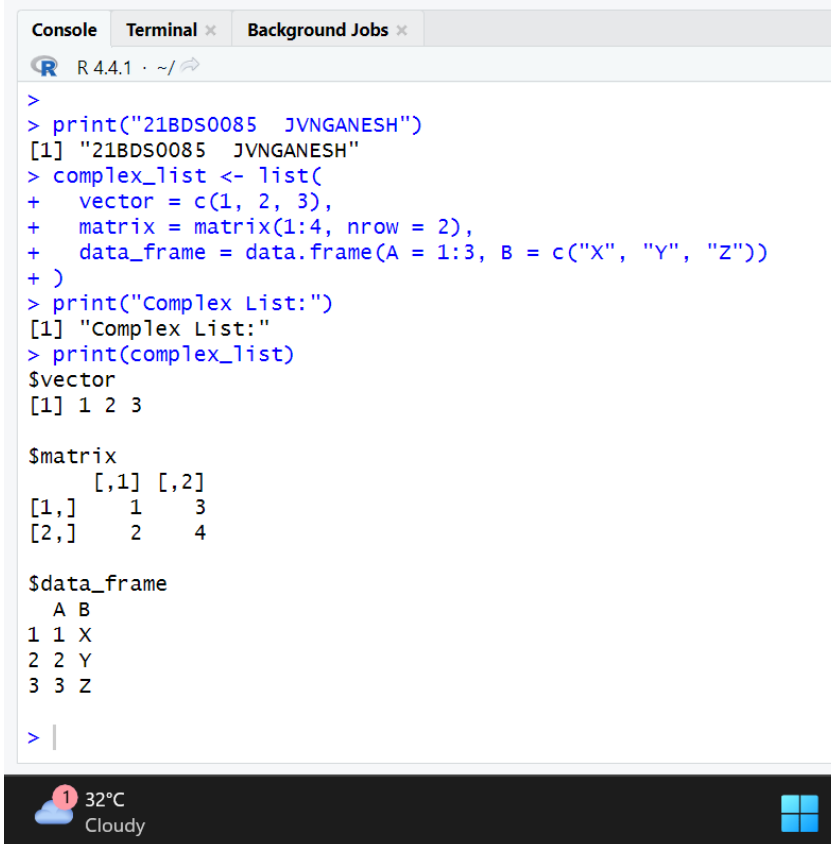
  data_frame = data.frame(A = 1:3, B = c("X", "Y", "Z"))

)

print("Complex List:")

print(complex_list)
```

Output

A screenshot of an R console window. The window has three tabs: 'Console', 'Terminal', and 'Background Jobs'. The 'Console' tab is active. The title bar shows 'R 4.4.1 · ~/'. The console displays the following R code and its output:

```
>
> print("21BDS0085 JVNGANESH")
[1] "21BDS0085 JVNGANESH"
> complex_list <- list(
+   vector = c(1, 2, 3),
+   matrix = matrix(1:4, nrow = 2),
+   data_frame = data.frame(A = 1:3, B = c("X", "Y", "Z"))
+ )
> print("Complex List:")
[1] "Complex List:"
> print(complex_list)
$vector
[1] 1 2 3

$matrix
      [,1] [,2]
[1,]    1    3
[2,]    2    4

$data_frame
  A B
1 1 X
2 2 Y
3 3 Z

> |
```

At the bottom of the window, there is a system tray area showing a weather icon with '1 32°C' and 'Cloudy', and a Windows taskbar icon.

9. Nested Lists

Code

#9

```
print("21BDS0085 JVNGANESH")

nested_list <- list(

  name = "Ganesh",

  age = 30,

  address = list(street = "123 Main St", city = "Anytown", zip = "52156")

)

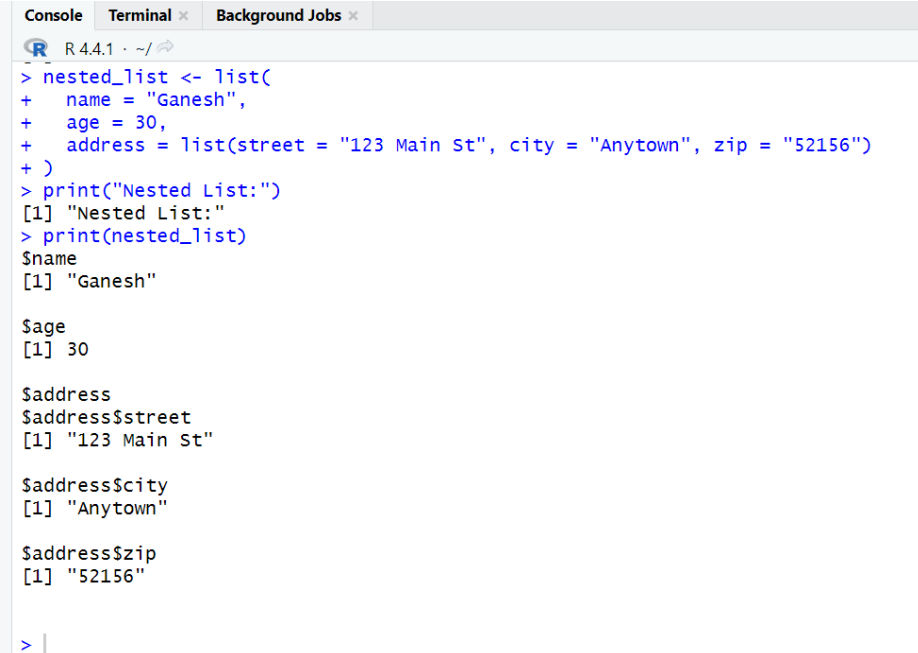
print("Nested List:")

print(nested_list)


print("Nested List Element 'address$city':")

print(nested_list$address$city)
```

Output



```
R 4.4.1 · ~/
> nested_list <- list(
+   name = "Ganesh",
+   age = 30,
+   address = list(street = "123 Main St", city = "Anytown", zip = "52156")
+ )
> print("Nested List:")
[1] "Nested List:"
> print(nested_list)
$name
[1] "Ganesh"

$age
[1] 30

$address
$address$street
[1] "123 Main St"

$address$city
[1] "Anytown"

$address$zip
[1] "52156"

> |
```

10. Creating and Manipulating a Data Frame

Code:

#10

```
print("21BDS0085 JVNGANESH")

data <- data.frame(

  ID = 1:5,

  Name = c("suresh", "ramesh", "harish", "girish", "hari"),

  Score = c(85, 92, 88, 90, 95)

)

print("Original Data Frame:")

print(data)
```

```
data$Grade <- ifelse(data$Score > 90, "A", "B")

print("Data Frame with New Column 'Grade':")

print(data)

subset_data <- data[data$Score > 90, ]

print("Subset of Data Frame (Score > 90):")

print(subset_data)
```

Output

```
Console Terminal Background Jobs
R 4.4.1 · ~/

> #10
>
> print("21BDS0085 JVNGANESH")
[1] "21BDS0085 JVNGANESH"
> data <- data.frame(
+   ID = 1:5,
+   Name = c("suresh", "ramesh", "harish", "girish", "hari"),
+   Score = c(85, 92, 88, 90, 95)
+ )
> print("Original Data Frame:")
[1] "Original Data Frame:"
> print(data)
  ID   Name Score
1  1 suresh   85
2  2 ramesh   92
3  3 harish   88
4  4 girish   90
5  5  hari   95
>
>
> data$Grade <- ifelse(data$Score > 90, "A", "B")
> print("Data Frame with New Column 'Grade':")
[1] "Data Frame with New Column 'Grade':"
> print(data)
  ID   Name Score Grade
1  1 suresh   85     B
2  2 ramesh   92     A
3  3 harish   88     B
4  4 girish   90     B
5  5  hari   95     A
>
>
> subset_data <- data[data$Score > 90, ]
> print("Subset of Data Frame (Score > 90):")
[1] "Subset of Data Frame (Score > 90):"
> print(subset_data)
  ID   Name Score Grade
2  2 ramesh   92     A
5  5  hari   95     A
> |
```

1 32°C Cloudy Search

PROGRAMS USING DATA STRUCTURES

1. Billing System

Code

```
# 1. Billing System
```

```
print("21BDS0085 Jvn Ganesh")
```

```
items <- data.frame(
```

```
  Item = c("Rice", "Wheat", "Dal", "Oil"),
```

```
  Price = c(40, 25, 60, 120)
```

```
)
```

```
billing_system <- function(selected_items, quantities) {
```

```
  total_cost <- 0
```

```
  for (i in 1:length(selected_items)) {
```

```
    item <- selected_items[i]
```

```
    quantity <- quantities[i]
```

```
    price <- items[items$Item == item, "Price"]
```

```
    total_cost <- total_cost + (price * quantity)
```

```
  }
```

```
  return(total_cost)
```

```
}
```

```
selected_items <- c("Rice", "Wheat", "Dal")
```

```
quantities <- c(2, 1, 1)
```

```
total_cost <- billing_system(selected_items, quantities)
```

```
print(paste("Total Cost:", total_cost))
```

Output

```
Console Terminal x Background Jobs x
R 4.4.1 · ~/
> # 1. Billing System
> print("21BDS0085 Jvn Ganesh")
[1] "21BDS0085 Jvn Ganesh"
> items <- data.frame(
+   Item = c("Rice", "Wheat", "Dal", "Oil"),
+   Price = c(40, 25, 60, 120)
+ )
> billing_system <- function(selected_items, quantities) {
+   total_cost <- 0
+   for (i in 1:length(selected_items)) {
+     item <- selected_items[i]
+     quantity <- quantities[i]
+     price <- items[items$Item == item, "Price"]
+     total_cost <- total_cost + (price * quantity)
+   }
+   return(total_cost)
+ }
> selected_items <- c("Rice", "Wheat", "Dal")
> quantities <- c(2, 1, 1)
> total_cost <- billing_system(selected_items, quantities)
> print(paste("Total Cost:", total_cost))
[1] "Total Cost: 165"
> |
```

2. Class Marks System

Code

2. Class Marks System

```
print("21BDS0085 Jvn Ganesh")
```

```
students <- data.frame(
```

```
  Name = c("Ravi", "Priya", "Kiran"),
```

```
  Math = c(90, 80, 85),
```

```
  Science = c(95, 75, 88),
```

```
  English = c(88, 92, 85)
```

```
)
```

```
calculate_average <- function(student) {
```

```
  subjects <- c("Math", "Science", "English")
```

```
  avg_marks <- mean(unlist(students[students$Name == student, subjects]))
```

```

    return(avg_marks)
}

student_name <- "Ravi"

average_marks <- calculate_average(student_name)

print(paste("Average Marks of", student_name, ":", average_marks))

Ouput

```

```

R 4.4.1 ~ ~/
> selected_items <- c("Rice", "wheat", "Dal")
> quantities <- c(2, 1, 1)
> total_cost <- billing_system(selected_items, quantities)
> print(paste("Total Cost:", total_cost))
[1] "Total Cost: 165"
> # 2. Class Marks System
> print("21BDS0085 Jvn Ganesh")
[1] "21BDS0085 Jvn Ganesh"
> students <- data.frame(
+   Name = c("Ravi", "Priya", "Kiran"),
+   Math = c(90, 80, 85),
+   Science = c(95, 75, 88),
+   English = c(88, 92, 85)
+ )
> calculate_average <- function(student) {
+   subjects <- c("Math", "Science", "English")
+   avg_marks <- mean(unlist(students[students$Name == student, subjects]))
+   return(avg_marks)
+ }
> student_name <- "Ravi"
> average_marks <- calculate_average(student_name)
> print(paste("Average Marks of", student_name, ":", average_marks))
[1] "Average Marks of Ravi : 91"
>

```

3. Employee records

Code

3. Employee Records

```

print("21BDS0085 Jvn Ganesh")

employees <- list(

  list(Name = "Raj", Age = 30, Department = "HR"),

  list(Name = "Sita", Age = 25, Department = "Finance"),

  list(Name = "Amit", Age = 35, Department = "IT")

)

find_employee_by_department <- function(department) {

  result <- lapply(employees, function(emp) {

    if (emp$Department == department) return(emp)

  })

  return(Filter(Negate(is.null), result))

}

```

```

department <- "IT"

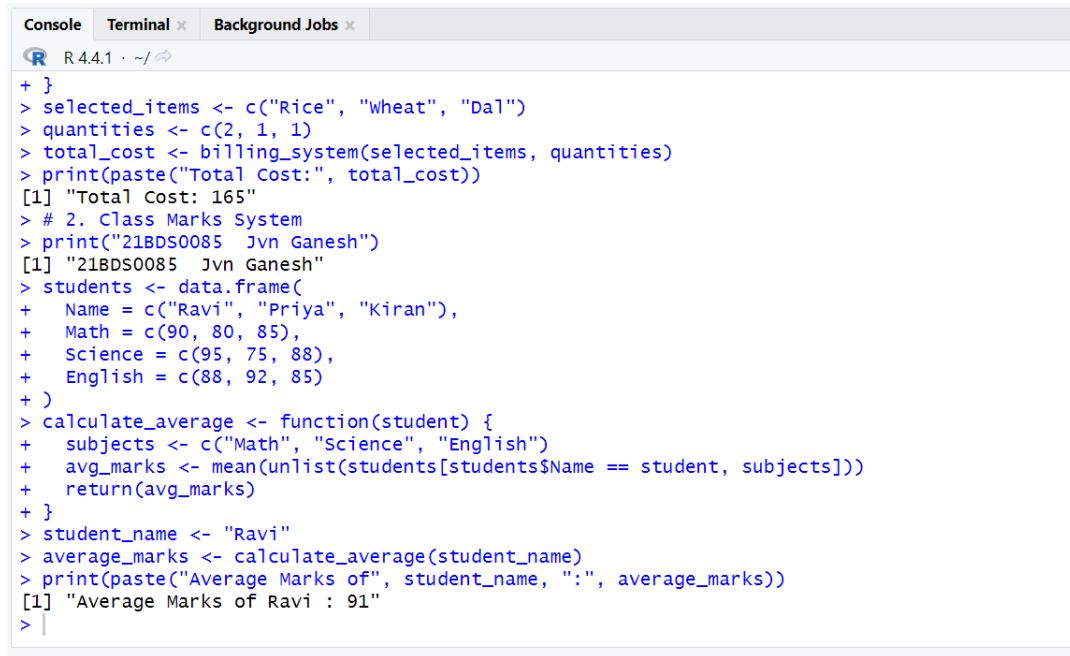
employees_in_dept <- find_employee_by_department(department)

print(paste("Employees in", department, "Department:"))

print(employees_in_dept)

```

Output



```

R 4.4.1 · ~/
+ }
> selected_items <- c("Rice", "Wheat", "Dal")
> quantities <- c(2, 1, 1)
> total_cost <- billing_system(selected_items, quantities)
> print(paste("Total Cost:", total_cost))
[1] "Total Cost: 165"
> # 2. Class Marks System
> print("21BDS0085 Jvn Ganesh")
[1] "21BDS0085 Jvn Ganesh"
> students <- data.frame(
+   Name = c("Ravi", "Priya", "Kiran"),
+   Math = c(90, 80, 85),
+   Science = c(95, 75, 88),
+   English = c(88, 92, 85)
+ )
> calculate_average <- function(student) {
+   subjects <- c("Math", "Science", "English")
+   avg_marks <- mean(unlist(students[students$Name == student, subjects]))
+   return(avg_marks)
+ }
> student_name <- "Ravi"
> average_marks <- calculate_average(student_name)
> print(paste("Average Marks of", student_name, ":", average_marks))
[1] "Average Marks of Ravi : 91"
>

```

4. Inventory management system

Code

4. Inventory Management System

```

print("21BDS0085 Jvn Ganesh")

inventory <- data.frame(

  Item = c("Laptop", "Mouse", "Keyboard", "Monitor"),

  Quantity = c(10, 50, 30, 20)

)

update_inventory <- function(item, quantity) {

  inventory[inventory$Item == item, "Quantity"] <- quantity

  return(inventory)
}

```



```

}

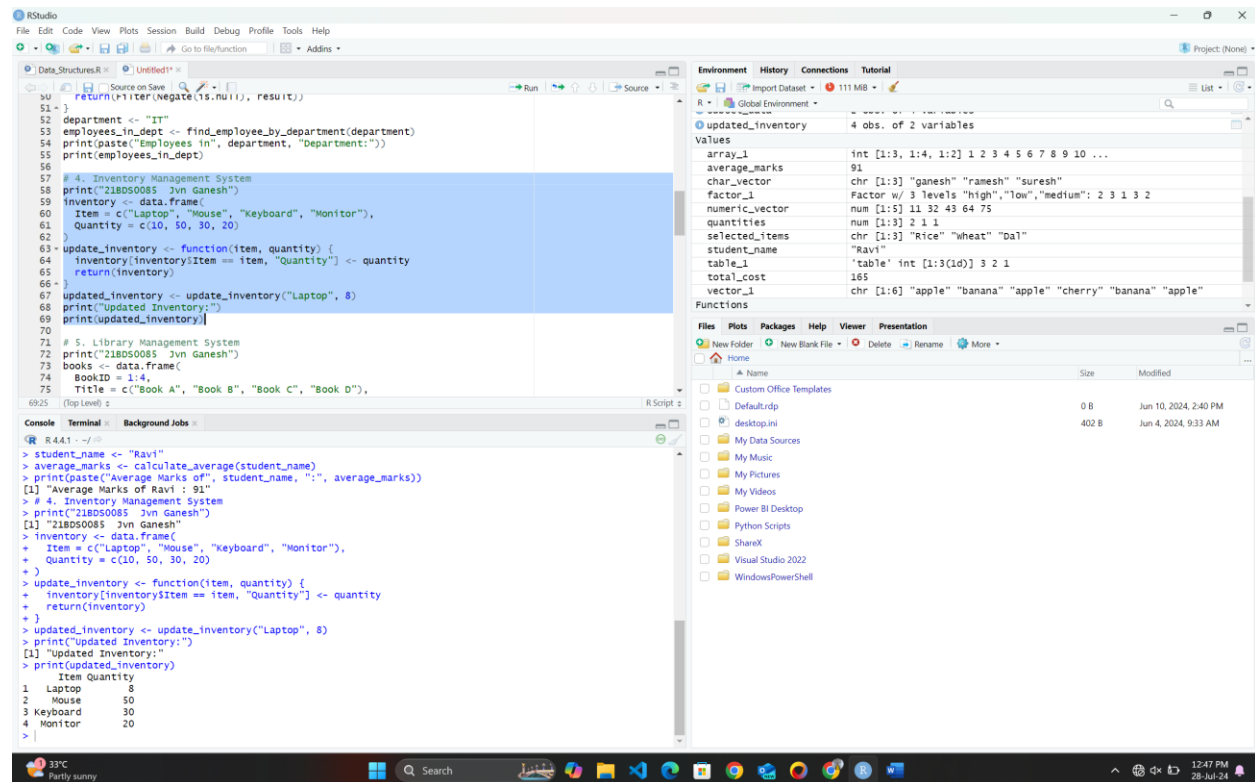
updated_inventory <- update_inventory("Laptop", 8)

print("Updated Inventory:")

print(updated_inventory)

```

Output



5. Library Management system

Code

5. Library Management System

```

print("21BDS0085 Jvn Ganesh")

books <- data.frame(

  BookID = 1:4,

  Title = c("Book A", "Book B", "Book C", "Book D"),

  Author = c("Author A", "Author B", "Author C", "Author D"),

```

```

    Available = c(TRUE, FALSE, TRUE, TRUE)
  )

  check_availability <- function(book_id) {

    available <- books[books$BookID == book_id, "Available"]

    return(available)

  }

  book_id <- 2

  availability <- check_availability(book_id)

  print(paste("Is Book ID", book_id, "available?", availability))

```

Output

```

RStudio
File Edit Code View Plots Session Build Debug Profile Tools Help
Go to file/function Go to file/function Addins
Data Structures.R
66- }
67 updated_inventory <- update_inventory("Laptop", 8)
68 print("Updated Inventory:")
69 print(updated_inventory)
70
71 # 5. Library Management System
72 print("21BDS0085 Jvn Ganesh")
73 books <- data.frame(
74   BookID = 1:4,
75   Title = c("Book A", "Book B", "Book C", "Book D"),
76   Author = c("Author A", "Author B", "Author C", "Author D"),
77   Available = c(TRUE, FALSE, TRUE, TRUE)
78 )
79 check_availability <- function(book_id) {
80   available <- books[books$BookID == book_id, "Available"]
81   return(available)
82 }
83 book_id <- 2
84 availability <- check_availability(book_id)
85 print(paste("Is Book ID", book_id, "available?", availability))
86
87 # 6. Student Attendance System
88 print("21BDS0085 Jvn Ganesh")
89 attendance <- matrix(c(1, 0, 1, 1, 1, 1, 0, 0), nrow = 4, byrow = TRUE)
90 colnames(attendance) <- c("Day1", "Day2")
91 rownames(attendance) <- c("Ravi", "Sudha", "Karan", "Neha")
92
Console Terminal Background Jobs
R 4.4.1 - /
[1] "Updated Inventory:"
> print(updated_inventory)
  Item Quantity
1 Laptop      8
2 Mouse     50
3 Keyboard  30
4 Monitor   20
> # 5. Library Management System
> print("21BDS0085 Jvn Ganesh")
[1] "21BDS0085 Jvn Ganesh"
> books <- data.frame(
+   BookID = 1:4,
+   Title = c("Book A", "Book B", "Book C", "Book D"),
+   Author = c("Author A", "Author B", "Author C", "Author D"),
+   Available = c(TRUE, FALSE, TRUE, TRUE)
+ )
> check_availability <- function(book_id) {
+   available <- books[books$BookID == book_id, "Available"]
+   return(available)
+ }
> book_id <- 2
> availability <- check_availability(book_id)
> print(paste("Is Book ID", book_id, "available?", availability))
[1] "Is Book ID 2 available? FALSE"
>
Environment History Connections Tutorial
R Global Environment
book_id 2
char_vector chr [1:3] "ganesh" "ramesh" "suresh"
factor_1 Factor w/ 3 levels "high","low","medium": 2 3 1 3 2
numeric_vector num [1:5] 11 32 43 64 75
quantities chr [1:3] 2 1 1
selected_items chr [1:3] "Rice" "wheat" "Dal"
student_name "Ravi"
table_1 'table' int [1:3(id)] 3 2 1
total_cost 165
vector_1 chr [1:6] "apple" "banana" "apple" "cherry" "banana" "apple"
Functions
billing_system function (selected_items, quantities)
calculate_average function (student)
check_availability function (book_id)
Files Plots Packages Help Viewer Presentation
New Folder New Blank File Delete Rename More
Home
Custom Office Templates
DefaultLrpd
desktop.ini
My Data Sources
My Music
My Pictures
My Videos
Power BI Desktop
Python Scripts
ShareX
Visual Studio 2022
WindowsPowerShell
33°C Partly sunny 12:48 PM 28-Jul-24

```

6.Student attendance

Code

```

# 6. Student Attendance System

print("21BDS0085 Jvn Ganesh")

```

```

attendance <- matrix(c(1, 0, 1, 1, 1, 1, 0, 0), nrow = 4, byrow = TRUE)

colnames attendance) <- c("Day1", "Day2")

rownames attendance) <- c("Ravi", "Priya", "Kiran", "Mohan")

attendance_percentage <- function(student) {

  total_days <- ncol attendance)

  present_days <- sum attendance student, ])

  percentage <- (present_days / total_days) * 100

  return percentage)

}

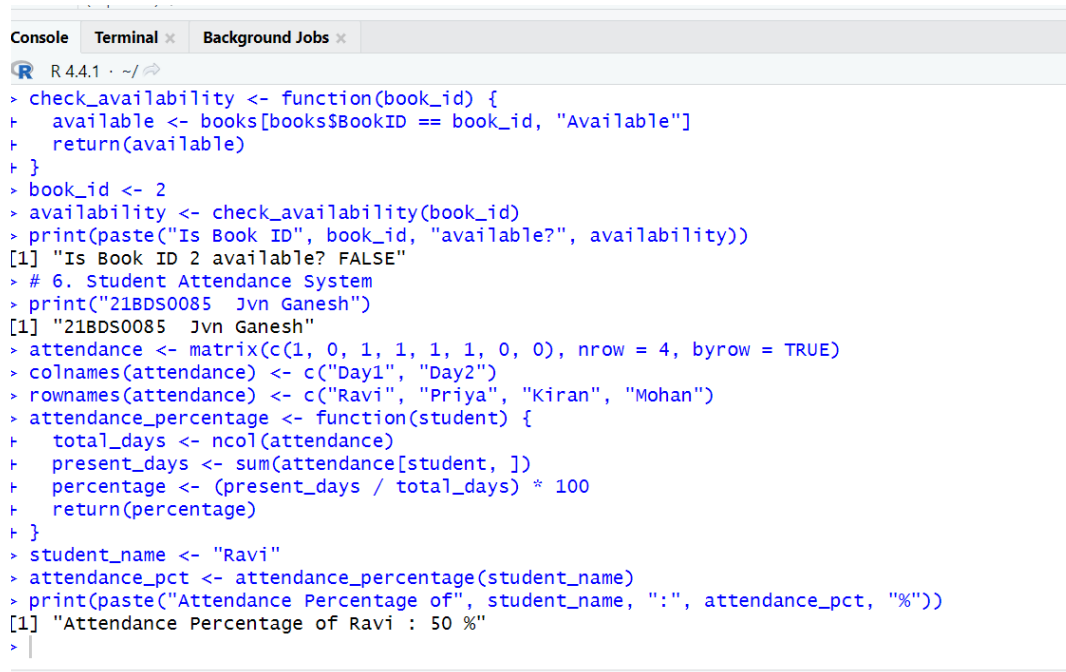
student_name <- "Ravi"

attendance_pct <- attendance_percentage student_name)

print(paste("Attendance Percentage of", student_name, ":", attendance_pct, "%"))

```

Output



```

R 4.4.1 · ~/
> check_availability <- function(book_id) {
+   available <- books[books$BookID == book_id, "Available"]
+   return(available)
+ }
> book_id <- 2
> availability <- check_availability(book_id)
> print(paste("Is Book ID", book_id, "available?", availability))
[1] "Is Book ID 2 available? FALSE"
> # 6. Student Attendance System
> print("21BDS0085 Jvn Ganesh")
[1] "21BDS0085 Jvn Ganesh"
> attendance <- matrix(c(1, 0, 1, 1, 1, 1, 0, 0), nrow = 4, byrow = TRUE)
> colnames attendance) <- c("Day1", "Day2")
> rownames attendance) <- c("Ravi", "Priya", "Kiran", "Mohan")
> attendance_percentage <- function(student) {
+   total_days <- ncol attendance)
+   present_days <- sum attendance student, ])
+   percentage <- (present_days / total_days) * 100
+   return percentage)
+ }
> student_name <- "Ravi"
> attendance_pct <- attendance_percentage student_name)
> print(paste("Attendance Percentage of", student_name, ":", attendance_pct, "%"))
[1] "Attendance Percentage of Ravi : 50 %"
>

```

7. Customer feedback system

Code

7. Customer Feedback System

```
print("21BDS0085 Jvn Ganesh")

feedback <- list(

  list(Customer = "Ravi", Rating = 4, Comment = "Good service"),

  list(Customer = "Priya", Rating = 5, Comment = "Excellent!"),

  list(Customer = "Kiran", Rating = 3, Comment = "Average experience")

)

average_rating <- function(feedback_list) {

  ratings <- sapply(feedback_list, function(fb) fb$Rating)

  avg_rating <- mean(ratings)

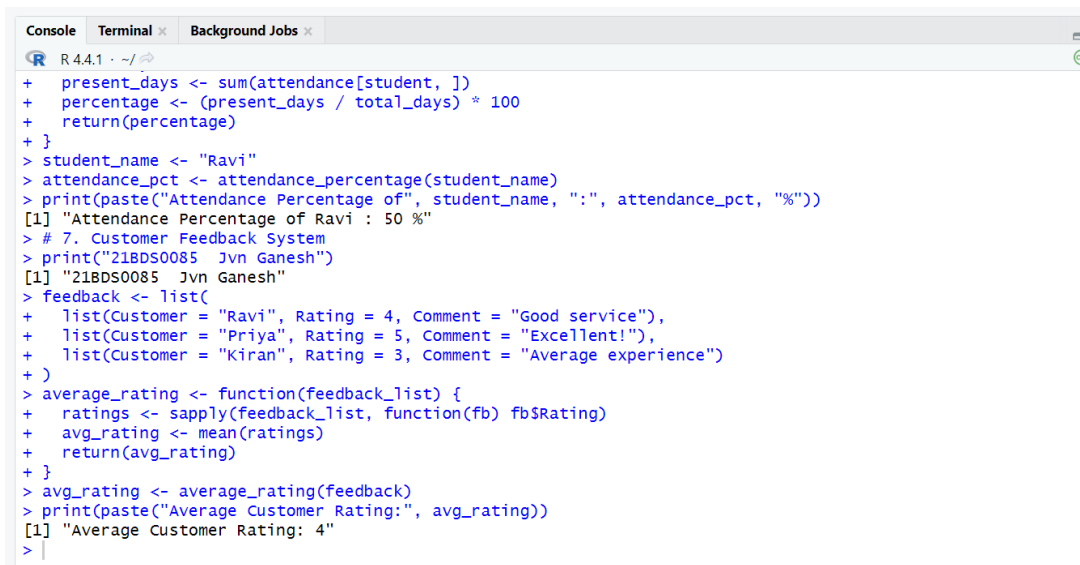
  return(avg_rating)

}

avg_rating <- average_rating(feedback)

print(paste("Average Customer Rating:", avg_rating))
```

Output



```
R 4.4.1 ~ /
+ present_days <- sum(attendance[student, ])
+ percentage <- (present_days / total_days) * 100
+ return(percentage)
+ }
> student_name <- "Ravi"
> attendance_pct <- attendance_percentage(student_name)
> print(paste("Attendance Percentage of", student_name, ":", attendance_pct, "%"))
[1] "Attendance Percentage of Ravi : 50 %"
> # 7. Customer Feedback System
> print("21BDS0085 Jvn Ganesh")
[1] "21BDS0085 Jvn Ganesh"
> feedback <- list(
+   list(Customer = "Ravi", Rating = 4, Comment = "Good service"),
+   list(Customer = "Priya", Rating = 5, Comment = "Excellent!"),
+   list(Customer = "Kiran", Rating = 3, Comment = "Average experience")
+ )
> average_rating <- function(feedback_list) {
+   ratings <- sapply(feedback_list, function(fb) fb$Rating)
+   avg_rating <- mean(ratings)
+   return(avg_rating)
+ }
> avg_rating <- average_rating(feedback)
> print(paste("Average Customer Rating:", avg_rating))
[1] "Average Customer Rating: 4"
> |
```

8. Sales record

Code

8. Sales Records

```
print("21BDS0085 Jvn Ganesh")

sales <- data.frame(

  SalesID = 1:4,

  Product = c("Product A", "Product B", "Product C", "Product D"),

  Quantity = c(10, 5, 8, 6),

  Price = c(100, 200, 150, 300)

)

total_sales_amount <- function(sales_data) {

  total_amount <- sum(sales_data$Quantity * sales_data$Price)

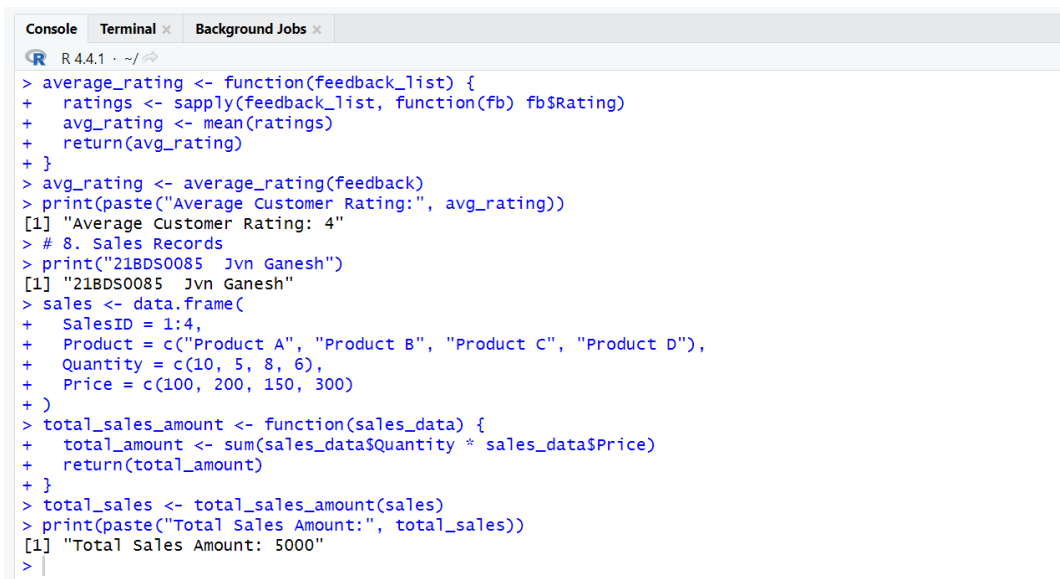
  return(total_amount)

}

total_sales <- total_sales_amount(sales)

print(paste("Total Sales Amount:", total_sales))
```

Output



```
R 4.4.1 · ~/
> average_rating <- function(feedback_list) {
+   ratings <- sapply(feedback_list, function(fb) fb$Rating)
+   avg_rating <- mean(ratings)
+   return(avg_rating)
+ }
> avg_rating <- average_rating(feedback)
> print(paste("Average Customer Rating:", avg_rating))
[1] "Average Customer Rating: 4"
> # 8. Sales Records
> print("21BDS0085 Jvn Ganesh")
[1] "21BDS0085 Jvn Ganesh"
> sales <- data.frame(
+   SalesID = 1:4,
+   Product = c("Product A", "Product B", "Product C", "Product D"),
+   Quantity = c(10, 5, 8, 6),
+   Price = c(100, 200, 150, 300)
+ )
> total_sales_amount <- function(sales_data) {
+   total_amount <- sum(sales_data$Quantity * sales_data$Price)
+   return(total_amount)
+ }
> total_sales <- total_sales_amount(sales)
> print(paste("Total Sales Amount:", total_sales))
[1] "Total Sales Amount: 5000"
>
```

9. Grocery list system

Code

9. Grocery List System

```
print("21BDS0085 Jvn Ganesh")

grocery_list <- data.frame(

  Item = c("Apple", "Banana", "Carrot", "Dates"),

  Quantity = c(5, 10, 4, 2),

  PricePerUnit = c(2, 1, 0.5, 3)

)

total_grocery_cost <- function(grocery) {

  total_cost <- sum(grocery$Quantity * grocery$PricePerUnit)

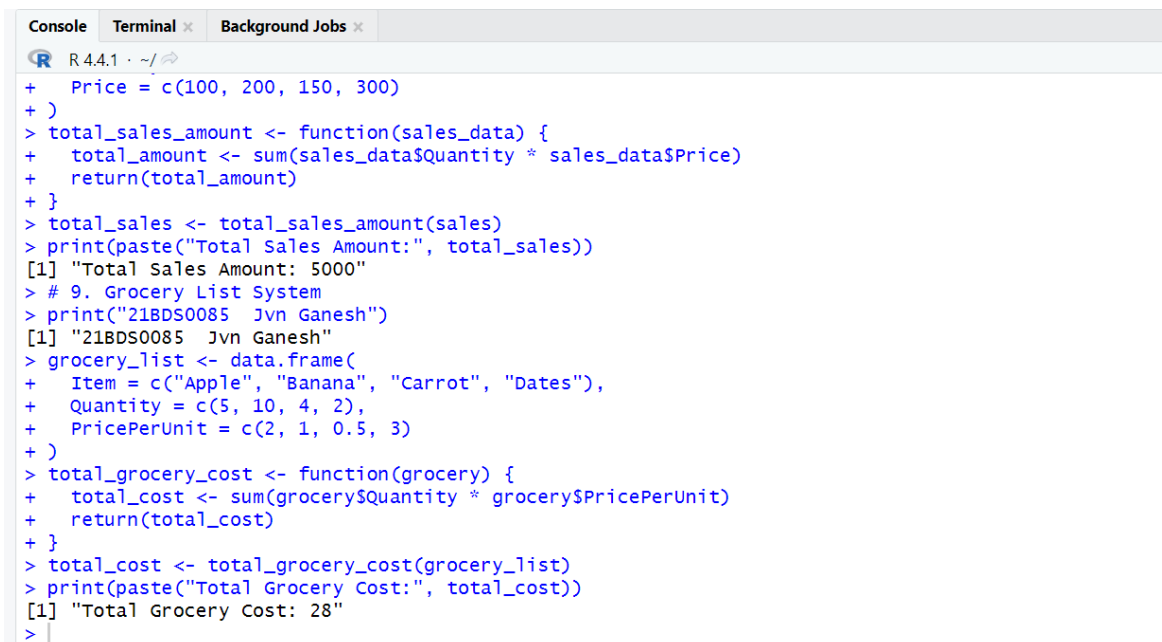
  return(total_cost)

}

total_cost <- total_grocery_cost(grocery_list)

print(paste("Total Grocery Cost:", total_cost))
```

Output



```
R 4.4.1 · ~/
+ Price = c(100, 200, 150, 300)
+ )
> total_sales_amount <- function(sales_data) {
+   total_amount <- sum(sales_data$Quantity * sales_data$Price)
+   return(total_amount)
+ }
> total_sales <- total_sales_amount(sales)
> print(paste("Total Sales Amount:", total_sales))
[1] "Total Sales Amount: 5000"
> # 9. Grocery List System
> print("21BDS0085 Jvn Ganesh")
[1] "21BDS0085 Jvn Ganesh"
> grocery_list <- data.frame(
+   Item = c("Apple", "Banana", "Carrot", "Dates"),
+   Quantity = c(5, 10, 4, 2),
+   PricePerUnit = c(2, 1, 0.5, 3)
+ )
> total_grocery_cost <- function(grocery) {
+   total_cost <- sum(grocery$Quantity * grocery$PricePerUnit)
+   return(total_cost)
+ }
> total_cost <- total_grocery_cost(grocery_list)
> print(paste("Total Grocery Cost:", total_cost))
[1] "Total Grocery Cost: 28"
> |
```

10.University enrollment system

Code

10. University Enrollment System

```
print("21BDS0085 Jvn Ganesh")

enrollment <- data.frame(

  StudentID = 1:4,

  Name = c("Ravi", "Priya", "Kiran", "Mohan"),

  Course = c("Math", "Science", "Math", "History"),

  Status = c("Enrolled", "Enrolled", "Waitlisted", "Enrolled")

)

students_by_course <- function(course_name) {

  students <- enrollment[enrollment$Course == course_name, "Name"]

  return(students)

}


course_name <- "Math"

students_in_course <- students_by_course(course_name)

print(paste("Students enrolled in", course_name, "course:"))

print(students_in_course)
```

Output



```
R 4.4.1 ~ /
+ return(total_cost)
+ }
> total_cost <- total_grocery_cost(grocery_list)
> print(paste("Total Grocery Cost:", total_cost))
[1] "Total Grocery Cost: 28"
> # 10. University Enrollment System
> print("21BDS0085 Jvn Ganesh")
[1] "21BDS0085 Jvn Ganesh"
> enrollment <- data.frame(
+   StudentID = 1:4,
+   Name = c("Ravi", "Priya", "Kiran", "Mohan"),
+   Course = c("Math", "Science", "Math", "History"),
+   Status = c("Enrolled", "Enrolled", "Waitlisted", "Enrolled")
+ )
> students_by_course <- function(course_name) {
+   students <- enrollment[enrollment$Course == course_name, "Name"]
+   return(students)
+ }
> course_name <- "Math"
> students_in_course <- students_by_course(course_name)
> print(paste("Students enrolled in", course_name, "course:"))
[1] "Students enrolled in Math course:"
> print(students_in_course)
[1] "Ravi" "Kiran"
>
```

FINAL CODES

EXP-1

Code

```
print("21BDS0085 JVNGANESH")
```

#10

```
print("21BDS0085 JVNGANESH")
```

```
data <- data.frame(
```

```
  ID = 1:5,
```

```
  Name = c("suresh", "ramesh", "harish", "girish", "hari"),
```

```
  Score = c(85, 92, 88, 90, 95)
```

```
)
```

```
print("Original Data Frame:")
```

```
print(data)
```

```
data$Grade <- ifelse(data$Score > 90, "A", "B")
```

```
print("Data Frame with New Column 'Grade':")
```

```
print(data)
```

```
subset_data <- data[data$Score > 90, ]
```

```
print("Subset of Data Frame (Score > 90):")
```

```
print(subset_data)
```

#9


```
print("21BDS0085 JVNGANESH")

nested_list <- list(

  name = "Ganesh",

  age = 30,

  address = list(street = "123 Main St", city = "Anytown", zip = "52156")

)

print("Nested List:")

print(nested_list)
```

```
print("Nested List Element 'address$city':")

print(nested_list$address$city)
```

#8

```
print("21BDS0085 JVNGANESH")

complex_list <- list(

  vector = c(1, 2, 3),

  matrix = matrix(1:4, nrow = 2),

  data_frame = data.frame(A = 1:3, B = c("X", "Y", "Z"))

)

print("Complex List:")

print(complex_list)
```

#7

```
print("21BDS0085 JVNGANESH")  
vector_1 <- c("apple", "banana", "apple", "cherry", "banana", "apple")  
table_1 <- table(vector_1)  
print("Table:")  
print(table_1)
```

#6

```
print("21BDS0085 JVNGANESH")  
factor_1 <- factor(c("low", "medium", "high", "medium", "low"))  
print("Factor:")  
print(factor_1)
```

```
print("Levels:")  
print(levels(factor_1))
```

#5

```
print("21BDS0085 JVNGANESH")  
data_frame_1 <- data.frame(  
  Name = c("Pranay", "gary", "jayanth"),
```

```
Age = c(28, 22, 35),  
Score = c(85, 90, 80)  
)  
print("Data Frame:")  
print(data_frame_1)  
  
print("Column 'Name':")  
print(data_frame_1$Name)
```

#4

```
list_1 <- list(name = "Ganesh", age = 22, scores = c(85, 90, 95))  
print("List:")  
print(list_1)  
  
print("List Element 'name':")  
print(list_1$name)
```

#3

```
array_1 <- array(1:24, dim = c(3, 4, 2))  
print("3D Array:")
```

```
print(array_1)
```

```
#2
```

```
matrix_1 <- matrix(1:9, nrow = 3, ncol = 3)
```

```
print("Matrix 1:")
```

```
print(matrix_1)
```

```
matrix_2 <- t(matrix_1)
```

```
print("Transposed Matrix:")
```

```
print(matrix_2)
```

```
#A1)
```

```
numeric_vector <- c(11, 32, 43, 64, 75)
```

```
print("Numeric Vector:")
```

```
print(numeric_vector)
```

```
char_vector <- c("ganesh", "ramesh", "suresh")
```

```
print("Character Vector:")
```

```
print(char_vector)
```

Code for examples:

```
# 1. Billing System
```

```
print("21BDS0085 Jvn Ganesh")
```

```
items <- data.frame(
  Item = c("Rice", "Wheat", "Dal", "Oil"),
  Price = c(40, 25, 60, 120)
)

billing_system <- function(selected_items, quantities) {
  total_cost <- 0
  for (i in 1:length(selected_items)) {
    item <- selected_items[i]
    quantity <- quantities[i]
    price <- items[items$Item == item, "Price"]
    total_cost <- total_cost + (price * quantity)
  }
  return(total_cost)
}

selected_items <- c("Rice", "Wheat", "Dal")
quantities <- c(2, 1, 1)
total_cost <- billing_system(selected_items, quantities)
print(paste("Total Cost:", total_cost))
```

2. Class Marks System

```
print("21BDS0085 Jvn Ganesh")

students <- data.frame(
  Name = c("Ravi", "Priya", "Kiran"),
  Math = c(90, 80, 85),
  Science = c(95, 75, 88),
  English = c(88, 92, 85)
)
```

```
calculate_average <- function(student) {  
  subjects <- c("Math", "Science", "English")  
  avg_marks <- mean(unlist(students[students$Name == student, subjects]))  
  return(avg_marks)  
}  
  
student_name <- "Ravi"  
  
average_marks <- calculate_average(student_name)  
  
print(paste("Average Marks of", student_name, ":", average_marks))
```

3. Employee Records

```
print("21BDS0085 Jvn Ganesh")  
  
employees <- list(  
  list(Name = "Raj", Age = 30, Department = "HR"),  
  list(Name = "Sita", Age = 25, Department = "Finance"),  
  list(Name = "Amit", Age = 35, Department = "IT")  
)  
  
find_employee_by_department <- function(department) {  
  result <- lapply(employees, function(emp) {  
    if (emp$Department == department) return(emp)  
  })  
  return(Filter(Negate(is.null), result))  
}  
  
department <- "IT"  
  
employees_in_dept <- find_employee_by_department(department)  
  
print(paste("Employees in", department, "Department:"))  
  
print(employees_in_dept)
```

4. Inventory Management System

```
print("21BDS0085 Jvn Ganesh")

inventory <- data.frame(

  Item = c("Laptop", "Mouse", "Keyboard", "Monitor"),

  Quantity = c(10, 50, 30, 20)

)

update_inventory <- function(item, quantity) {

  inventory[inventory$Item == item, "Quantity"] <- quantity

  return(inventory)

}

updated_inventory <- update_inventory("Laptop", 8)

print("Updated Inventory:")

print(updated_inventory)
```

5. Library Management System

```
print("21BDS0085 Jvn Ganesh")

books <- data.frame(

  BookID = 1:4,

  Title = c("Book A", "Book B", "Book C", "Book D"),

  Author = c("Author A", "Author B", "Author C", "Author D"),

  Available = c(TRUE, FALSE, TRUE, TRUE)

)

check_availability <- function(book_id) {

  available <- books[books$BookID == book_id, "Available"]

  return(available)

}

book_id <- 2
```

```
availability <- check_availability(book_id)

print(paste("Is Book ID", book_id, "available?", availability))
```

6. Student Attendance System

```
print("21BDS0085 Jvn Ganesh")

attendance <- matrix(c(1, 0, 1, 1, 1, 1, 0, 0), nrow = 4, byrow = TRUE)

colnames attendance) <- c("Day1", "Day2")

rownames attendance) <- c("Ravi", "Priya", "Kiran", "Mohan")

attendance_percentage <- function(student) {

  total_days <- ncol attendance)

  present_days <- sum attendance student, ])

  percentage <- (present_days / total_days) * 100

  return percentage)

}

student_name <- "Ravi"

attendance_pct <- attendance_percentage(student_name)

print(paste("Attendance Percentage of", student_name, ":", attendance_pct, "%"))
```

7. Customer Feedback System

```
print("21BDS0085 Jvn Ganesh")

feedback <- list(

  list(Customer = "Ravi", Rating = 4, Comment = "Good service"),

  list(Customer = "Priya", Rating = 5, Comment = "Excellent!"),

  list(Customer = "Kiran", Rating = 3, Comment = "Average experience")

)

average_rating <- function(feedback_list) {

  ratings <- sapply(feedback_list, function(fb) fb$Rating)
```



```
    avg_rating <- mean(ratings)
    return(avg_rating)
}

avg_rating <- average_rating(feedback)

print(paste("Average Customer Rating:", avg_rating))
```

8. Sales Records

```
print("21BDS0085 Jvn Ganesh")

sales <- data.frame(
  SalesID = 1:4,
  Product = c("Product A", "Product B", "Product C", "Product D"),
  Quantity = c(10, 5, 8, 6),
  Price = c(100, 200, 150, 300)
)

total_sales_amount <- function(sales_data) {
  total_amount <- sum(sales_data$Quantity * sales_data$Price)
  return(total_amount)
}

total_sales <- total_sales_amount(sales)

print(paste("Total Sales Amount:", total_sales))
```

9. Grocery List System

```
print("21BDS0085 Jvn Ganesh")

grocery_list <- data.frame(
  Item = c("Apple", "Banana", "Carrot", "Dates"),
  Quantity = c(5, 10, 4, 2),
  PricePerUnit = c(2, 1, 0.5, 3)
```

```

)

total_grocery_cost <- function(grocery) {
  total_cost <- sum(grocery$Quantity * grocery$PricePerUnit)
  return(total_cost)
}

total_cost <- total_grocery_cost(grocery_list)

print(paste("Total Grocery Cost:", total_cost))

```

10. University Enrollment System

```

print("21BDS0085 Jvn Ganesh")

enrollment <- data.frame(
  StudentID = 1:4,
  Name = c("Ravi", "Priya", "Kiran", "Mohan"),
  Course = c("Math", "Science", "Math", "History"),
  Status = c("Enrolled", "Enrolled", "Waitlisted", "Enrolled")
)

students_by_course <- function(course_name) {
  students <- enrollment[enrollment$Course == course_name, "Name"]
  return(students)
}

course_name <- "Math"

students_in_course <- students_by_course(course_name)

print(paste("Students enrolled in", course_name, "course:"))

print(students_in_course)

```

Code for exp-2

1. Fibonacci Sequence

```
print("21BDS0085 Jvn Ganesh")
```

```
fibonacci <- function(n) {
```

```
  fib <- numeric(n)
```

```
  fib[1] <- 0
```

```
  fib[2] <- 1
```

```
  for (i in 3:n) {
```

```
    fib[i] <- fib[i - 1] + fib[i - 2]
```

```
  }
```

```
  return(fib)
```

```
}
```

```
# 2. Armstrong Number Check
```

```
print("21BDS0085 Jvn Ganesh")
```

```
is_armstrong <- function(num) {
```

```
  num_str <- as.character(num)
```

```
  num_digits <- nchar(num_str)
```

```
  sum_digits <- 0
```

```
  for (i in 1:num_digits) {
```

```
    digit <- as.numeric(substr(num_str, i, i))
```

```
    sum_digits <- sum_digits + (digit^num_digits)
```

```
  }
```

```
  return(sum_digits == num)
```

```
}
```

```
# 3. Prime Number Check
```

```
print("21BDS0085 Jvn Ganesh")
```

```
is_prime <- function(num) {
```

```
if (num <= 1) return(FALSE)
for (i in 2:sqrt(num)) {
  if (num %% i == 0) return(FALSE)
}
return(TRUE)
}
```

4. Factorial Calculation

```
print("21BDS0085 Jvn Ganesh")
factorial <- function(n) {
  result <- 1
  for (i in 2:n) {
    result <- result * i
  }
  return(result)
}
```

5. Palindrome Check

```
print("21BDS0085 Jvn Ganesh")
is_palindrome <- function(num) {
  num_str <- as.character(num)
  return(num_str == paste(rev(strsplit(num_str, NULL)[[1]]), collapse = ""))
}
```

6. Sum of Digits

```
print("21BDS0085 Jvn Ganesh")
sum_of_digits <- function(num) {
```

```
num_str <- as.character(num)
sum_digits <- 0
for (i in 1:nchar(num_str)) {
  sum_digits <- sum_digits + as.numeric(substr(num_str, i, i))
}
return(sum_digits)
}
```

7. Reverse a Number

```
print("21BDS0085 Jvn Ganesh")
reverse_number <- function(num) {
  num_str <- as.character(num)
  reversed_str <- paste(rev(strsplit(num_str, NULL)[[1]]), collapse = "")
  return(as.numeric(reversed_str))
}
```

8. Perfect Number Check

```
print("21BDS0085 Jvn Ganesh")
is_perfect <- function(num) {
  sum_divisors <- 0
  for (i in 1:(num - 1)) {
    if (num %% i == 0) sum_divisors <- sum_divisors + i
  }
  return(sum_divisors == num)
}
```

9. Sum of First N Natural Numbers

```
print("21BDS0085 Jvn Ganesh")

sum_natural_numbers <- function(n) {

  sum <- 0

  for (i in 1:n){

    sum <- sum + i

  }

  return(sum)

}
```

10. GCD of Two Numbers

```
print("21BDS0085 Jvn Ganesh")

gcd <- function(a, b){

  while (b != 0){

    temp <- b

    b <- a %% b

    a <- temp

  }

  return(a)

}
```

Example usage of all functions

```
print("21BDS0085 Jvn Ganesh")

num_terms <- 10

cat("Fibonacci sequence with", num_terms, "terms:\n", fibonacci(num_terms), "\n\n")

print("21BDS0085 Jvn Ganesh")

number <- 153
```

```
cat(number, "is an Armstrong number:", is_armstrong(number), "\n\n")
```

```
print("21BDS0085 Jvn Ganesh")
```

```
number <- 29
```

```
cat(number, "is a Prime number:", is_prime(number), "\n\n")
```

```
print("21BDS0085 Jvn Ganesh")
```

```
number <- 5
```

```
cat("Factorial of", number, "is", factorial(number), "\n\n")
```

```
print("21BDS0085 Jvn Ganesh")
```

```
number <- 121
```

```
cat(number, "is a Palindrome:", is_palindrome(number), "\n\n")
```

```
print("21BDS0085 Jvn Ganesh")
```

```
number <- 123
```

```
cat("Sum of digits of", number, "is", sum_of_digits(number), "\n\n")
```

```
print("21BDS0085 Jvn Ganesh")
```

```
number <- 1234
```

```
cat("Reversed number of", number, "is", reverse_number(number), "\n\n")
```

```
print("21BDS0085 Jvn Ganesh")
```

```
number <- 28
```

```
cat(number, "is a Perfect number:", is_perfect(number), "\n\n")
```

```
print("21BDS0085 Jvn Ganesh")
```

```
number <- 10
```

```
cat("Sum of first", number, "natural numbers is", sum_natural_numbers(number), "\n\n")
```

```
print("21BDS0085 Jvn Ganesh")
```

```
a <- 48
```

```
b <- 18
```

```
cat("GCD of", a, "and", b, "is", gcd(a, b), "\n\n")
```