Data Analytics Using R Lab Exercises:

Exercise 1: Basic Arithmetic Operations

Consider a scenario, you are working as a cashier at a grocery store. Your task is to create a program that simulates the checkout process for a customer's shopping cart. The program should calculate the total cost of the items, including tax, and provide a detailed receipt.

i. Define a list of products, each represented as a dictionary with keys: "name", "price", and "quantity".
ii. Allow the cashier to input the products in the customer's shopping cart, including the name, price, and quantity of each item.
iii. Calculate the subtotal (price * quantity) for each item and display a detailed receipt with product names, quantities, prices, and subtotals.
iv. Calculate the total cost of the items in the cart before tax.
v. Apply a tax rate (e.g., 8%) to the total cost to calculate the tax amount.
vi. Calculate the final total cost by adding the tax amount to the total cost before tax.

Code in R:

 # List of products

```
products <- list(
  list(name = "Apple", price =120),
  list(name = "Banana", price = 35),
  list(name = "Milk", price = 25),
  list(name = "Bread", price = 50),
  list(name = "Eggs", price = 10)
)
```

```r
# Initialize shopping cart as an empty list
shopping_cart <- list()

# Define items to be added to the cart
cart_items_to_add <- list(
  list(name = "Apple", quantity = 3),
  list(name = "Milk", quantity = 2)
)

# Add items to the shopping cart
for (item in cart_items_to_add) {
  product_name <- item$name
  quantity <- item$quantity

  # Find the product in the list
  product <- NULL
  for (p in products) {
   if (p$name == product_name) {
     product <- p
     break
   }
  }

  if (!is.null(product)) {
    cart_item <- list(name = product$name, price = product$price, quantity = quantity)
```

```r
    shopping_cart <- c(shopping_cart, list(cart_item))
    cat("Item added to cart.\n")
  } else {
    cat("Product not found.\n")
  }
}
```

Calculate and display receipt

```r
subtotal <- 0
cat("\nReceipt:\n")
for (item in shopping_cart) {
  item_subtotal <- item$price * item$quantity
  cat(sprintf("%s (%d units) - Price: $%.2f - Subtotal: $%.2f\n", item$name,
item$quantity, item$price, item_subtotal))
  subtotal <- subtotal + item_subtotal
}

tax_rate <- 0.08
tax_amount <- subtotal * tax_rate
total_cost_before_tax <- subtotal
total_cost <- total_cost_before_tax + tax_amount

cat("\nSubtotal: $%.2f\n", subtotal)
cat("Tax Amount (8%): $%.2f\n", tax_amount)
cat("Total Cost: $%.2f\n", total_cost)
```

Exercise 2: Loops Operations

Imagine that, you have been tasked with creating a program that calculates and assigns grades for students enrolled in multiple courses. The program will take input for the marks obtained by 10 students in 5 different courses, compute the total and average marks for each student, and assign corresponding grades based on their average performance.

Declare constants for the number of students (num_students) and the number of courses (num_courses).

Initialize an empty list to store student information.

For each student:

- Input the student's name.
- Input marks for each of the 5 courses.
- Calculate the total marks and average marks.
- Determine the grade based on the average marks using a grading scale.
- Display the student information, including their name, individual course marks, total marks, average marks, and the assigned grade.

Code in R:

 # Constants

num_students <- 10

num_courses <- 5

Predefined student names

```r
student_names <- c("John", "Anna", "Tim", "Harry", "Pal",  "Jim",
"Peter",  "Bob", " Cook", "James")
```

Predefined course marks for each student

```r
course_marks <- matrix(c(
  85, 92, 78, 88, 95, 88, 89, 78,77,81,
  75, 80, 85, 70, 60, 90, 67, 70,89,87,
  100, 78, 56, 34, 56, 45, 78, 97,66,89,
  78, 45, 67, 89, 90, 56, 89, 67,99,98,
  89,80,67,78,90, 67, 78,90, 78, 78
), nrow = num_students, byrow = TRUE)
```

Initialize a list to store student information

```r
student_records <- list()
```

Loop for each student

```r
for (student_index in 1:num_students) {
  student_name <- student_names[student_index]
```

  # Initialize variables for calculations

```r
  total_marks <- sum(course_marks[student_index, ])
  average_marks <- total_marks / num_courses
```

```r
# Determine grade based on average marks
grade <- ifelse(average_marks >= 90, "A",
         ifelse(average_marks >= 80,"B",
         ifelse(average_marks >= 70, "C",
         ifelse(average_marks >= 60, "D", "F"))))


# Store student information in a record
student_record <- list(name = student_name, marks = course_marks[student_index, ],
                 total = total_marks, average = average_marks, grade = grade)


student_records <- c(student_records, list(student_record))
}


# Display student information
cat("\nStudent Grade Report:\n")
for (student_record in student_records) {
 cat("\nName:", student_record$name, "\n")
 cat("Marks:", student_record$marks, "\n")
 cat("Total Marks:", student_record$total, "\n")
 cat("Average Marks:", student_record$average, "\n")
 cat("Grade:", student_record$grade, "\n")
}
```