VIGNESH G ITA0448 STATISTICS WITH R PROGRAMMING

192121099

Assignment-II

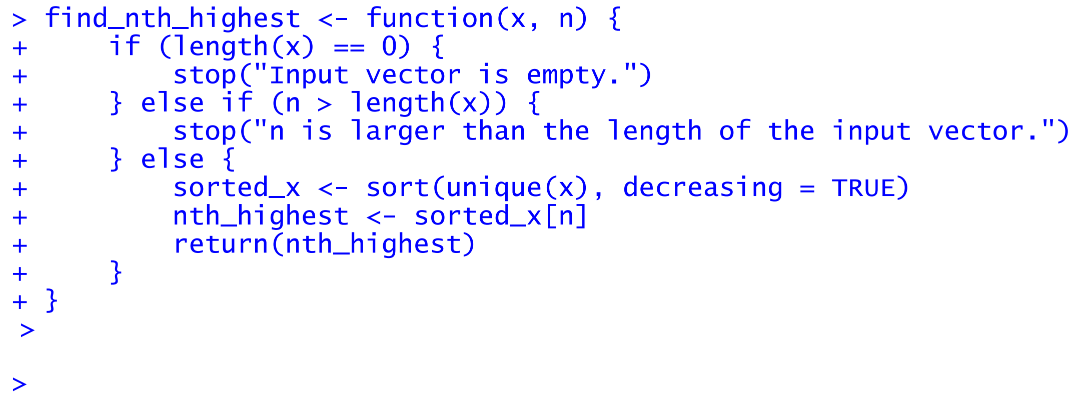
SET-1:

3. Write R function to find nth highest value of a vector in the R program

PROGRAM:

```
        find_nth_highest <- function(x, n) {   if
(length(x) == 0) {     stop("Input vector is empty.")   }
else if (n > length(x)) {     stop("n is larger than the
length of the input vector.")
 } else {
   sorted_x <- sort(unique(x), decreasing = TRUE)
nth_highest <- sorted_x[n]     return(nth_highest)
 }
}
```

OUTPUT:



```
> find_nth_highest <- function(x, n) {
+     if (length(x) == 0) {
+         stop("Input vector is empty.")
+     } else if (n > length(x)) {
+         stop("n is larger than the length of the input vector.")
+     } else {
+         sorted_x <- sort(unique(x), decreasing = TRUE)
+         nth_highest <- sorted_x[n]
+         return(nth_highest)
+     }
+ }
 >

>
```

5. Write R Program to find maximum and minimum value of a given vector using control statement.

PROGRAM:

```
find_max_min <- function(x) {

if (length(x) == 0) {

stop("Input vector is empty.")

 } else {     max_val <-

x[1]     min_val <- x[1]

for (i in 2:length(x)) {

if (x[i] > max_val) {

max_val <- x[i]

     }

     if (x[i] < min_val) {

min_val <- x[i]

     }

   }

   return(list("max" = max_val, "min" = min_val))

 }

}
```

OUTPUT:

```
> find_max_min <- function(x) {
+     if (length(x) == 0) {
+         stop("Input vector is empty.")
+     } else {
+         max_val <- x[1]
+         min_val <- x[1]
+         for (i in 2:length(x)) {
+             if (x[i] > max_val) {
+                 max_val <- x[i] +
}
+             if (x[i] < min_val) {
+                 min_val <- x[i]
+             }
+         }
+         return(list("max" = max_val, "min" = min_val)) +
}
+ }
 >

>
```

5. Write R Program to find maximum and minimum value of a given vector using control statement.

PROGRAM:

```
# Define a vector of numbers

my_vector <- c(3, 5, 2, 8, 4, 9, 1)


# Set the initial values of the maximum and minimum to be the first element of the vector

max_value <- my_vector[1] min_value <- my_vector[1]


# Loop through the vector using a for loop for

(i in 2:length(my_vector)) {


  # If the current value is greater than the current maximum, update the maximum

if (my_vector[i] > max_value) {     max_value <- my_vector[i]

  }


  # If the current value is less than the current minimum, update the minimum

if (my_vector[i] < min_value) {     min_value <- my_vector[i]

  }

}


# Print the maximum and minimum values

cat("Maximum value:", max_value, "\n")

cat("Minimum value:", min_value)
```

OUTPUT:

```
> # Define a vector of numbers
> my_vector <- c(3, 5, 2, 8, 4, 9, 1)
>
```

```
> # Set the initial values of the maximum and minimum to be the first eleme
nt of the vector
> max_value <- my_vector[1]
> min_value <- my_vector[1]
>
> # Loop through the vector using a for loop
> for (i in 2:length(my_vector)) {
+
+     # If the current value is greater than the current maximum, update th
e maximum
+     if (my_vector[i] > max_value) {
+         max_value <- my_vector[i]
+     }
+
+     # If the current value is less than the current minimum, update the m
inimum
+     if (my_vector[i] < min_value) {
+         min_value <- my_vector[i]
+     }
+ }
>
> # Print the maximum and minimum values
> cat("Maximum value:", max_value, "\n")
Maximum value: 9
> cat("Minimum value:", min_value)
 Minimum value: 1>

>
```

SET 2 :

1. Create the following matrices (i) Square Matrix (ii) Identity Matrix (iii)diagonal matrix

PROGRAM:

(i) Square Matrix:

```
# Create a square matrix of size 3x3

square_matrix <- matrix(c(1, 2, 3, 4, 5, 6, 7, 8, 9), nrow = 3, ncol = 3)


# Print the matrix square_matrix
```

OUTPUT:

```
> # Create a square matrix of size 3x3
> square_matrix <- matrix(c(1, 2, 3, 4, 5, 6, 7, 8, 9), nrow = 3, ncol = 3)
>
> # Print the matrix
> square_matrix
     [,1] [,2] [,3]
[1,]    1    4    7
[2,]    2    5    8
[3,]    3    6    9
>
```

```
 >

>
```

(ii) Identity Matrix:

# Create an identity matrix of size 3x3 identity_matrix

<- diag(3)

# Print the matrix identity_matrix

OUTPUT:

```
> # Create an identity matrix of size 3x3
> identity_matrix <- diag(3)
>
> # Print the matrix
> identity_matrix
     [,1] [,2] [,3]
[1,]    1    0    0
[2,]    0    1    0
[3,]    0    0    1
 >

>
```

(iii) Diagonal Matrix:

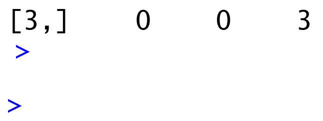
# Create a diagonal matrix of size 3x3 diagonal_matrix

<- diag(c(1, 2, 3))

# Print the matrix diagonal_matrix

OUTPUT:

```
> # Create a diagonal matrix of size 3x3
> diagonal_matrix <- diag(c(1, 2, 3))
>
> # Print the matrix
> diagonal_matrix
     [,1] [,2] [,3]
[1,]    1    0    0
[2,]    0    2    0
```



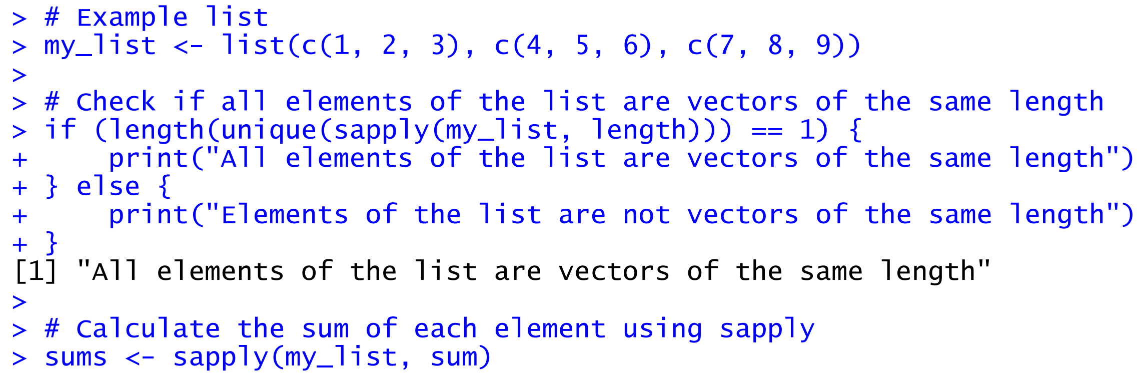
```
 [3,]    0    0    3
 >
 >
```

2. Using sapply, check that all elements of the list are vectors of the same length. Also calculate the sum of each element.

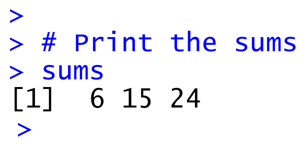
PROGRAM:

```
# Example list my_list <- list(c(1, 2, 3), c(4,

5, 6), c(7, 8, 9))


# Check if all elements of the list are vectors of the same length

if (length(unique(sapply(my_list, length))) == 1) {   print("All

elements of the list are vectors of the same length")

} else {   print("Elements of the list are not vectors of the same

length")

}


# Calculate the sum of each element using sapply sums

<- sapply(my_list, sum)


# Print the sums

Sums
```

OUTPUT:



```
> # Example list
> my_list <- list(c(1, 2, 3), c(4, 5, 6), c(7, 8, 9))
>
> # Check if all elements of the list are vectors of the same length
> if (length(unique(sapply(my_list, length))) == 1) {
+     print("All elements of the list are vectors of the same length")
+ } else {
+     print("Elements of the list are not vectors of the same length")
+ }
[1] "All elements of the list are vectors of the same length"
>
> # Calculate the sum of each element using sapply
> sums <- sapply(my_list, sum)
```



```
>
> # Print the sums
> sums
[1]  6 15 24
 >
```

3. We found out that the blood pressure instrument is under-recording each measure and all measurement incorrect by 0.1. How would you add 0.1 to all values in the blood vector?

PROGRAM:

# Example vector blood_pressure <- c(120,

130, 140, 150, 160)

# Add 0.1 to all values in the vector

blood_pressure <- blood_pressure + 0.1

# Print the updated vector

blood_pressure

4. We found out that the first patient is 33 years old. How would you change the first element of the vector age to 33 years?

PROGRAM:

# Example vector

age <- c(25, 30, 35, 40, 45)

# Change the first element of the vector to 33 years age[1]

<- 33

# Print the updated vector

Age

OUTPUT:

```
> # Example vector
> age <- c(25, 30, 35, 40, 45)
>
> # Change the first element of the vector to 33 years
> age[1] <- 33
>
> # Print the updated vector
> age
[1] 33 30 35 40 45
 >

>
```

5. Suppose A = [1 1 3 5 2 6 −2 −1 −3] (a) Check that A 3 = 0 where 0 is a 3 × 3 matrix with every entry equal to 0. (b) Replace the third column of A by the sum of the second and third columns

PROGRAM:

A)

# Define the matrix A

A <- c(1, 1, 3, 5, 2, 6, -2, -1, -3)

# Create a 3x3 submatrix from the first nine elements of A

A_sub <- matrix(A[1:9], nrow = 3)

# Check if A_sub is a zero matrix all(A_sub

== 0)

OUTPUT:

```
> # Define the matrix A
> A <- c(1, 1, 3, 5, 2, 6, -2, -1, -3)
>
> # Create a 3x3 submatrix from the first nine elements of A
> A_sub <- matrix(A[1:9], nrow = 3)
>
```

```
> # Check if A_sub is a zero matrix
> all(A_sub == 0)
[1] FALSE
 >

>
```

B)

```
# Define the matrix A

A <- c(1, 1, 3, 5, 2, 6, -2, -1, -3)



# Replace the third column of A by the sum of the second and third columns A[,3]

<- A[,2] + A[,3]



# Print the updated matrix A

A
```

OUTPUT:

```
> # Define the matrix A
> A <- c(1, 1, 3, 5, 2, 6, -2, -1, -3)
>
> # Replace the third column of A by the sum of the second and third colum
ns
> A[,3] <- A[,2] + A[,3]
```