

R PROGRAMMING

DAY 3 LAB MANUAL

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UNIVARIATE ANALYSIS IN R - MEASURES OF CENTRAL TENDENCY

Exercise:

I. ARITHMETIC MEAN

a) Write suitable R code to compute the average of the following values.

12,7,3,4.2,18,2,54,-21,8,-5

program:

```
values <- c(12, 7, 3, 4.2, 18, 2, 54, -21, 8, -5)
```

```
mean(values)
```

output:

```
> # create a vector of values
```

```
> values <- c(12, 7, 3, 4.2, 18, 2, 54, -21, 8, -5)
```

```
>
```

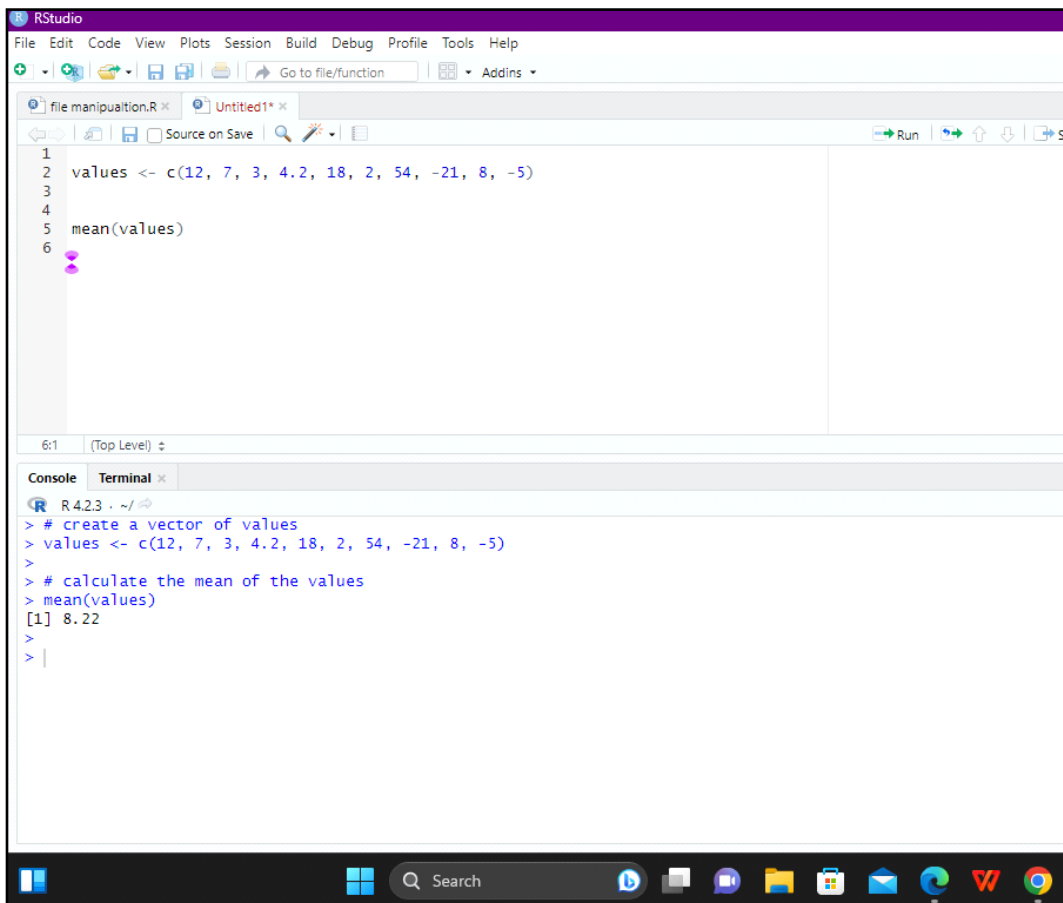
```
> # calculate the mean of the values
```

```
> mean(values)
```

```
[1] 8.22
```

```
>
```

SCREENSHOT:



The screenshot displays the RStudio interface. The script editor on the left contains the following R code:

```
1  
2 values <- c(12, 7, 3, 4.2, 18, 2, 54, -21, 8, -5)  
3  
4  
5 mean(values)  
6
```

The console at the bottom shows the execution of this code:

```
R 4.2.3 . ~/   
> # create a vector of values  
> values <- c(12, 7, 3, 4.2, 18, 2, 54, -21, 8, -5)  
>  
> # calculate the mean of the values  
> mean(values)  
[1] 8.22  
>  
> |
```

b) Compute the mean after applying the trim option and removing 3 values from each end.

PROGRAM:

```
# create a vector of values
```

```
values <- c(12, 7, 3, 4.2, 18, 2, 54, -21, 8, -5)
```

```
# calculate the mean after trimming 3 values from each end
```

```
mean(values, trim = 0.3)
```

OUTPUT:

```
> # create a vector of values
```

```
> values <- c(12, 7, 3, 4.2, 18, 2, 54, -21, 8, -5)
```

```
>
```

```
> # calculate the mean after trimming 3 values from each end
```

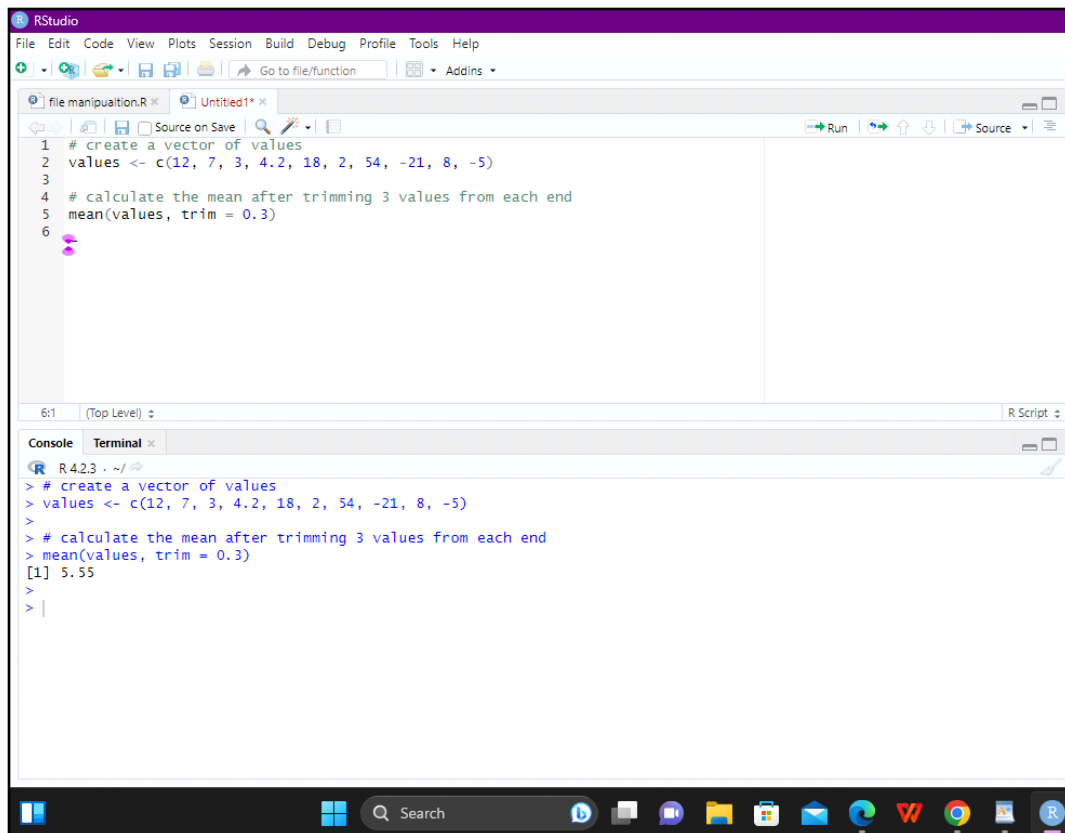
```
> mean(values, trim = 0.3)
```

```
[1] 5.55
```

```
>
```

```
>
```

SCREENSHOT;



c) Compute the mean of the following vector .

(12,7,3,4.2,18,2,54,-21,8,-5,NA)

PROGRAM:

create a vector of values

values <- c(12, 7, 3, 4.2, 18, 2, 54, -21, 8, -5, NA)

calculate the mean of the values, excluding NA values

mean(values, na.rm = TRUE)

OUTPUT:

```
> # create a vector of values

> values <- c(12, 7, 3, 4.2, 18, 2, 54, -21, 8, -5, NA)

>

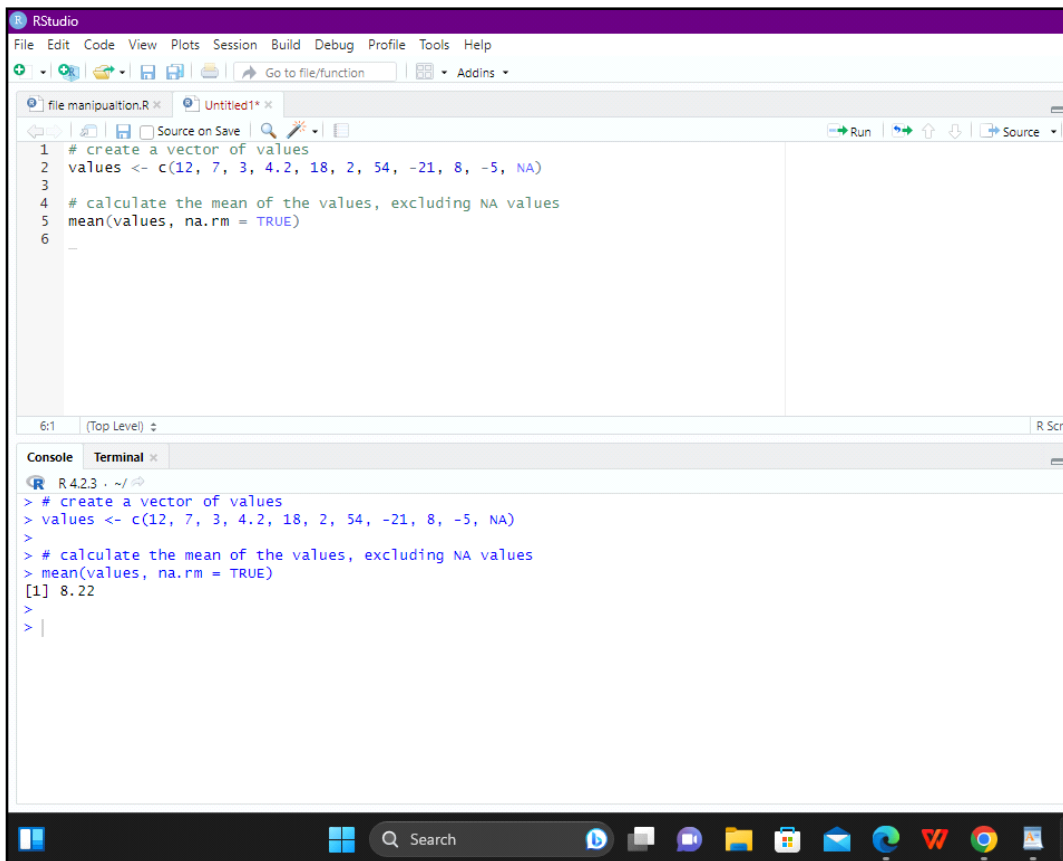
> # calculate the mean of the values, excluding NA values

> mean(values, na.rm = TRUE)

[1] 8.22

>
```

SCREENSHOT:

A screenshot of the RStudio interface. The top menu bar includes File, Edit, Code, View, Plots, Session, Build, Debug, Profile, Tools, and Help. Below the menu is a toolbar with icons for file operations and running code. The main editor window shows a script with the following R code:

```
1 # create a vector of values
2 values <- c(12, 7, 3, 4.2, 18, 2, 54, -21, 8, -5, NA)
3
4 # calculate the mean of the values, excluding NA values
5 mean(values, na.rm = TRUE)
6
```

The console window at the bottom shows the execution of the code:

```
R 4.2.3 ~ /
> # create a vector of values
> values <- c(12, 7, 3, 4.2, 18, 2, 54, -21, 8, -5, NA)
>
> # calculate the mean of the values, excluding NA values
> mean(values, na.rm = TRUE)
[1] 8.22
>
>
```

The Windows taskbar is visible at the bottom of the screen.

II.MEDIAN

Write suitable R code to compute the median of the following values.

12,7,3,4.2,18,2,54,-21,8,-5

PROGRAM:

create a vector of values

values <- c(12, 7, 3, 4.2, 18, 2, 54, -21, 8, -5)

calculate the median of the values

median(values)

OUTPUT:

> # create a vector of values

> values <- c(12, 7, 3, 4.2, 18, 2, 54, -21, 8, -5)

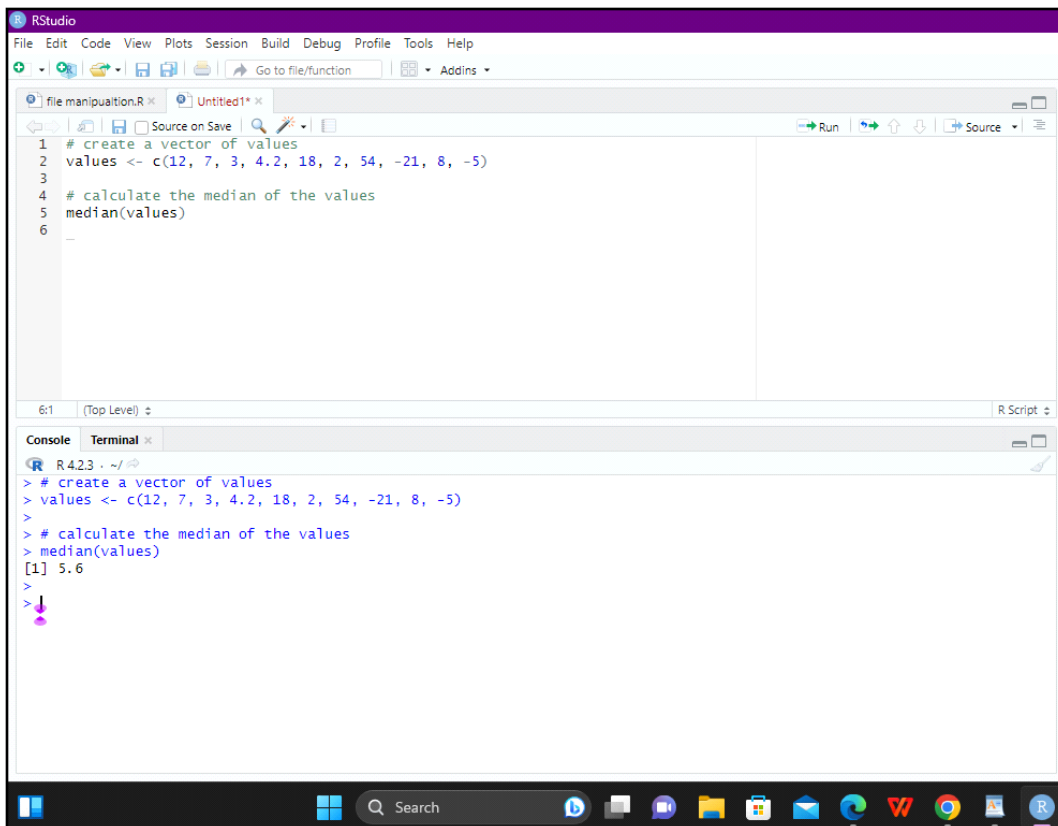
>

> # calculate the median of the values

> median(values)

[1] 5.6

SCREENSHOT:



III. MODE

Calculate the mode for the following numeric as well as character data set in R.

**(2,1,2,3,1,2,3,4,1,5,5,3,2,3) ,
("o","it","the","it","i
t")**

PROGRAM:

numeric data set

values_numeric <- c(2, 1, 2, 3, 1, 2, 3, 4, 1, 5, 5, 3, 2, 3)

user-defined function to calculate mode for numeric data set

mode_numeric <- function(x) {

ux <- unique(x)

```
ux[which.max(tabulate(match(x, ux)))]  
}
```

```
# calculate the mode of the numeric data set using the user-defined  
function
```

```
mode_numeric(values_numeric)
```

```
# character data set
```

```
values_char <- c("o", "it", "the", "it", "it")
```

```
# calculate the mode of the character data set
```

```
mode(values_char)
```

OUTPUT:

```
> # numeric data set
```

```
> values_numeric <- c(2, 1, 2, 3, 1, 2, 3, 4, 1, 5, 5, 3, 2, 3)
```

```
>
```

```
> # user-defined function to calculate mode for numeric data set
```

```
> mode_numeric <- function(x) {
```

```
+   ux <- unique(x)
```

```
+   ux[which.max(tabulate(match(x, ux)))]
```

```
+ }
```

```
>
```

```
> # calculate the mode of the numeric data set using the user-defined  
function
```

```
> mode_numeric(values_numeric)
```

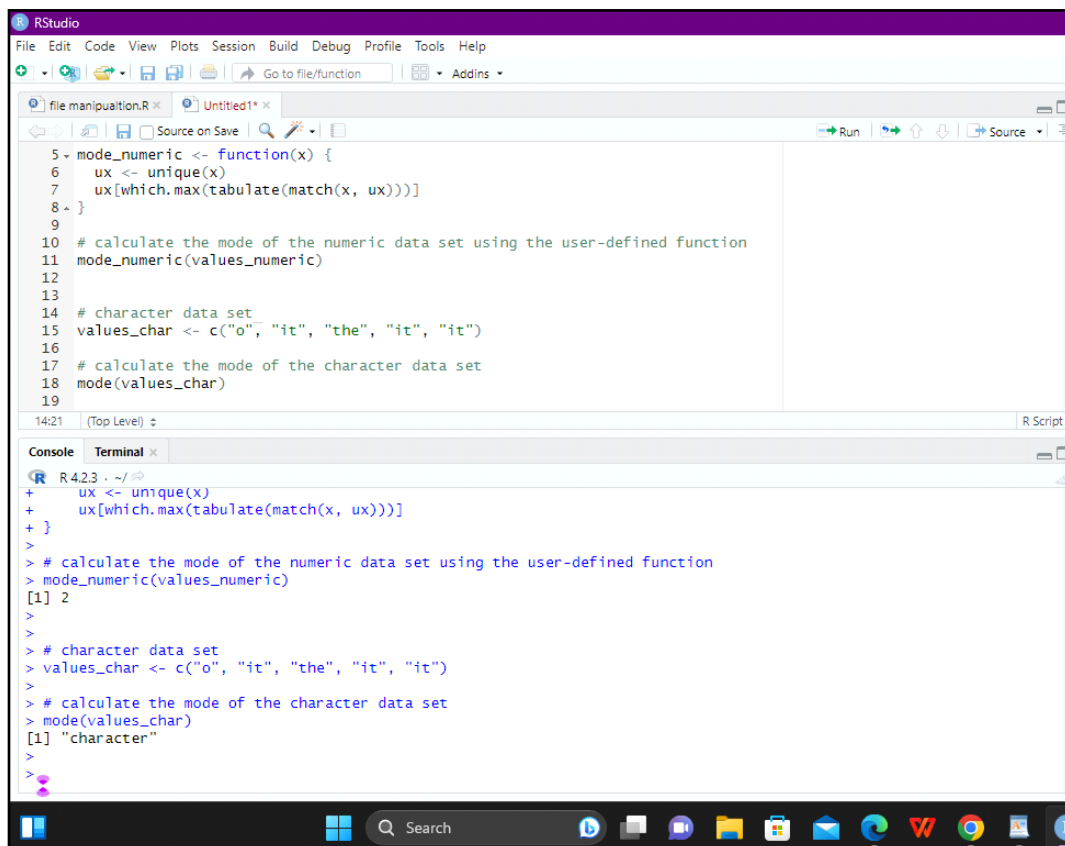
```
[1] 2
```

```
>
```



```
>
> # character data set
> values_char <- c("o", "it", "the", "it", "it")
>
> # calculate the mode of the character data set
> mode(values_char)
[1] "character"
>
>
```

SCREENSHOT:



The screenshot displays the RStudio interface. The script editor on the left contains the following R code:

```
5 mode_numeric <- function(x) {
6   ux <- unique(x)
7   ux[which.max(tabulate(match(x, ux)))]
8 }
9
10 # calculate the mode of the numeric data set using the user-defined function
11 mode_numeric(values_numeric)
12
13
14 # character data set
15 values_char <- c("o", "it", "the", "it", "it")
16
17 # calculate the mode of the character data set
18 mode(values_char)
19
```

The console on the right shows the execution of the code:

```
R 4.2.3 ~ /
+ ux <- unique(x)
+ ux[which.max(tabulate(match(x, ux)))]
+ }
+
>
> # calculate the mode of the numeric data set using the user-defined function
> mode_numeric(values_numeric)
[1] 2
>
>
> # character data set
> values_char <- c("o", "it", "the", "it", "it")
>
> # calculate the mode of the character data set
> mode(values_char)
[1] "character"
>
```

UNIVARIATE ANALYSIS IN R - MEASURES OF DISPERSION

Exercise: 4

- i) Find the car which gives maximum city miles per gallon
- ii) Find the cars which gives minimum disp in compact and subcompact class

PROGRAM:

```
# install and load the needed packages
```

```
install.packages("ggplot2") # for accessing the mpg dataset
```

```
library(ggplot2)
```

```
# download the mpg dataset from the URL and load it into R
```

```
mpg <- read.csv("https://vincentarelbundock.github.io/Rdatasets/csv/ggplot2/mpg.csv")
```

```
# i) Find the car which gives maximum city miles per gallon
```

```
max_city_mpg_car <- mpg[mpg$cty == max(mpg$cty), "model"]
```

```
print(paste0("Car with maximum city miles per gallon: ", max_city_mpg_car))
```

```
# ii) Find the cars which gives minimum disp in compact and subcompact class
```

```
compact_subcompact <- mpg[mpg$class %in% c("compact", "subcompact"),]
```

```
min_disp_cars <- compact_subcompact[compact_subcompact$displ ==  
min(compact_subcompact$displ), "model"]
```

```
print(paste0("Car(s) with minimum displacement in compact and subcompact class: ",  
min_disp_cars))
```

OUTPUT:

```
> # download the mpg dataset from the URL and load it into R

> mpg <- read.csv("https://vincentarelbundock.github.io/Rdatasets/csv/ggplot2/mpg.csv")

>

> # i) Find the car which gives maximum city miles per gallon

> max_city_mpg_car <- mpg[mpg$cty == max(mpg$cty), "model"]

> print(paste0("Car with maximum city miles per gallon: ", max_city_mpg_car))

[1] "Car with maximum city miles per gallon: new beetle"

>

> # ii) Find the cars which gives minimum disp in compact and subcompact class

> compact_subcompact <- mpg[mpg$class %in% c("compact", "subcompact"),]

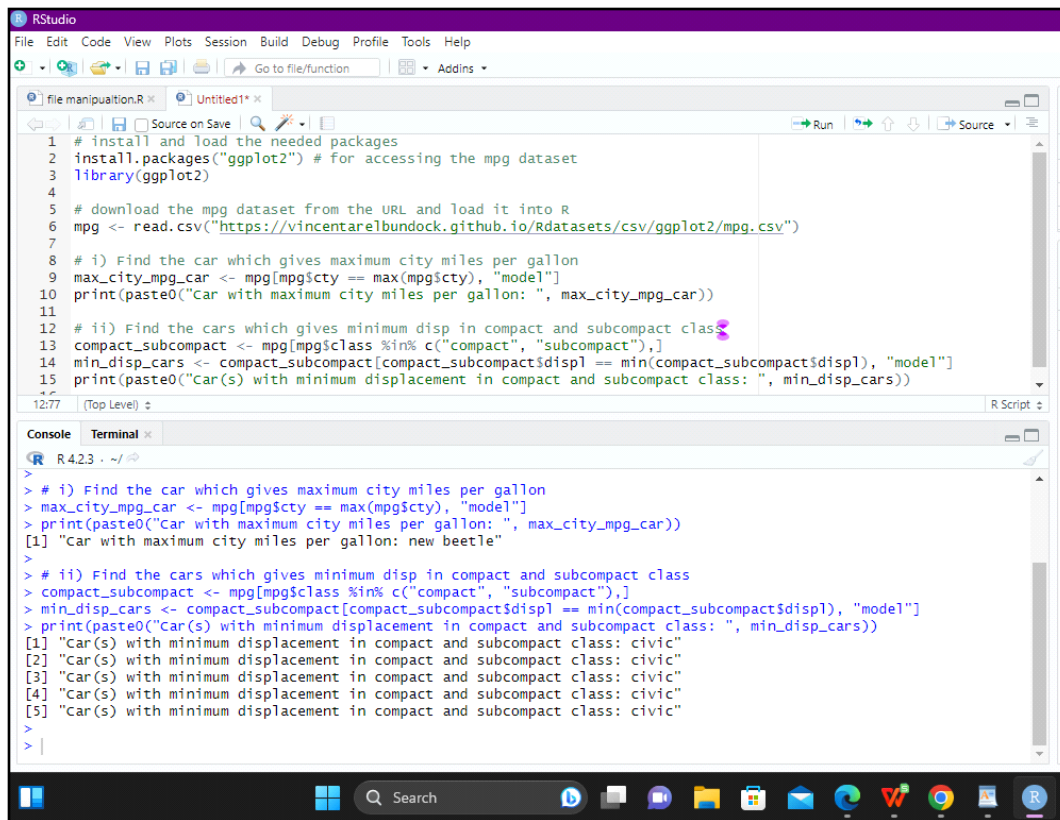
> min_disp_cars <- compact_subcompact[compact_subcompact$displ ==
min(compact_subcompact$displ), "model"]

> print(paste0("Car(s) with minimum displacement in compact and subcompact class: ",
min_disp_cars))

[1] "Car(s) with minimum displacement in compact and subcompact class: civic"
[2] "Car(s) with minimum displacement in compact and subcompact class: civic"
[3] "Car(s) with minimum displacement in compact and subcompact class: civic"
[4] "Car(s) with minimum displacement in compact and subcompact class: civic"
[5] "Car(s) with minimum displacement in compact and subcompact class: civic"

>
```

SCREENSHOT:



```
1 # install and load the needed packages
2 install.packages("ggplot2") # for accessing the mpg dataset
3 library(ggplot2)
4
5 # download the mpg dataset from the URL and load it into R
6 mpg <- read.csv("https://vincentarelbundock.github.io/Rdatasets/csv/ggplot2/mpg.csv")
7
8 # i) Find the car which gives maximum city miles per gallon
9 max_city_mpg_car <- mpg[mpg$cty == max(mpg$cty), "model"]
10 print(paste0("Car with maximum city miles per gallon: ", max_city_mpg_car))
11
12 # ii) Find the cars which gives minimum disp in compact and subcompact class
13 compact_subcompact <- mpg[mpg$class %in% c("compact", "subcompact"),]
14 min_disp_cars <- compact_subcompact[compact_subcompact$displ == min(compact_subcompact$displ), "model"]
15 print(paste0("Car(s) with minimum displacement in compact and subcompact class: ", min_disp_cars))
```

```
>
> # i) Find the car which gives maximum city miles per gallon
> max_city_mpg_car <- mpg[mpg$cty == max(mpg$cty), "model"]
> print(paste0("Car with maximum city miles per gallon: ", max_city_mpg_car))
[1] "Car with maximum city miles per gallon: new beetle"
>
> # ii) Find the cars which gives minimum disp in compact and subcompact class
> compact_subcompact <- mpg[mpg$class %in% c("compact", "subcompact"),]
> min_disp_cars <- compact_subcompact[compact_subcompact$displ == min(compact_subcompact$displ), "model"]
> print(paste0("Car(s) with minimum displacement in compact and subcompact class: ", min_disp_cars))
[1] "Car(s) with minimum displacement in compact and subcompact class: civic"
[2] "Car(s) with minimum displacement in compact and subcompact class: civic"
[3] "Car(s) with minimum displacement in compact and subcompact class: civic"
[4] "Car(s) with minimum displacement in compact and subcompact class: civic"
[5] "Car(s) with minimum displacement in compact and subcompact class: civic"
>
```

Exercise: 5

Use the same dataset as used in Exercise 4 and perform the following queries

- i) Find the standard deviation of city miles per gallon
- ii) Find the variance of highway miles per gallon

PROGRAM:

load the ggplot2 package

library(ggplot2)

```
# load the mpg dataset
```

```
data(mpg)
```

```
# i) Find the standard deviation of city miles per gallon
```

```
sd_city_mpg <- sd(mpg$cty)
```

```
print(paste0("Standard deviation of city miles per gallon: ", sd_city_mpg))
```

```
# ii) Find the variance of highway miles per gallon
```

```
var_highway_mpg <- var(mpg$hwy)
```

```
print(paste0("Variance of highway miles per gallon: ", var_highway_mpg))
```

OUTPUT:

```
# load the ggplot2 package
```

```
> library(ggplot2)
```

```
>
```

```
> # load the mpg dataset
```

```
> data(mpg)
```

```
>
```

```
> # i) Find the standard deviation of city miles per gallon
```

```
> sd_city_mpg <- sd(mpg$cty)
```

```
> print(paste0("Standard deviation of city miles per gallon: ", sd_city_mpg))
```

```
[1] "Standard deviation of city miles per gallon: 4.2559456788894"
```

```
>
```

```
> # ii) Find the variance of highway miles per gallon
```

```
> var_highway_mpg <- var(mpg$hwy)
```

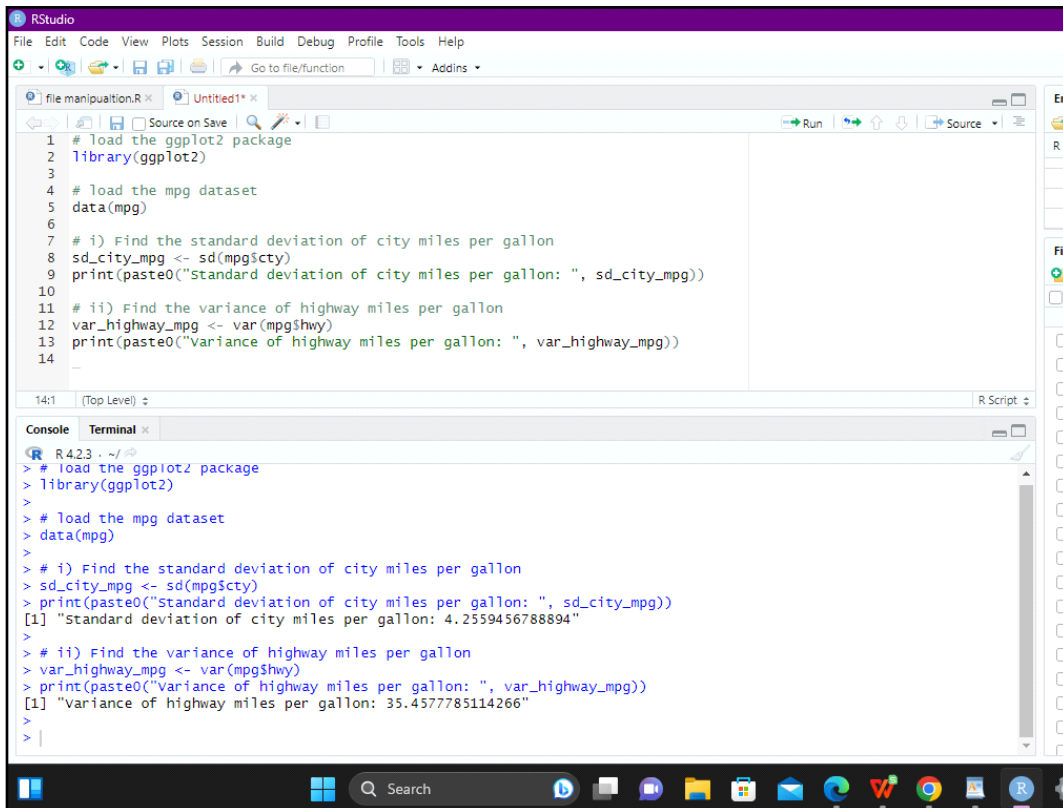
```
> print(paste0("Variance of highway miles per gallon: ", var_highway_mpg))
```

```
[1] "Variance of highway miles per gallon: 35.4577785114266"
```

>

>

SCREENSHOT:



The screenshot shows the RStudio interface. The source editor contains the following R code:

```
1 # load the ggplot2 package
2 library(ggplot2)
3
4 # load the mpg dataset
5 data(mpg)
6
7 # i) Find the standard deviation of city miles per gallon
8 sd_city_mpg <- sd(mpg$cty)
9 print(paste0("Standard deviation of city miles per gallon: ", sd_city_mpg))
10
11 # ii) Find the variance of highway miles per gallon
12 var_highway_mpg <- var(mpg$hw)
13 print(paste0("Variance of highway miles per gallon: ", var_highway_mpg))
14
```

The console shows the output of the code:

```
R 4.2.3 ~ ./
> # load the ggplot2 package
> library(ggplot2)
>
> # load the mpg dataset
> data(mpg)
>
> # i) Find the standard deviation of city miles per gallon
> sd_city_mpg <- sd(mpg$cty)
> print(paste0("Standard deviation of city miles per gallon: ", sd_city_mpg))
[1] "Standard deviation of city miles per gallon: 4.2559456788894"
>
> # ii) Find the variance of highway miles per gallon
> var_highway_mpg <- var(mpg$hw)
> print(paste0("Variance of highway miles per gallon: ", var_highway_mpg))
[1] "Variance of highway miles per gallon: 35.4577785114266"
>
>
```

Exercise 6

Use the same dataset and perform the following queries

i) Find the range of the disp in the data set mpg

ii) Find the Quartile of the disp in the data set mpg

iii) Find the IQR of the disp column in the data set mpg

PROGRAM:

```
# load the ggplot2 package
```

```
library(ggplot2)
```

```
# load the mpg dataset
```

```
data(mpg)
```

```
# i) Find the range of the disp in the data set mpg
```

```
range_disp <- range(mpg$displ)
```

```
print(paste0("Range of disp in the mpg dataset: ", range_disp))
```

```
# ii) Find the Quartile of the disp in the data set mpg
```

```
quantiles_disp <- quantile(mpg$displ)
```

```
print(paste0("Quartiles of disp in the mpg dataset: ", quantiles_disp))
```

```
# iii) Find the IQR of the disp column in the data set mpg
```

```
iqr_disp <- IQR(mpg$displ)
```

```
print(paste0("IQR of disp in the mpg dataset: ", iqr_disp))
```

OUTPUT:

```
> # load the ggplot2 package
```

```
> library(ggplot2)
```

```
>
```

```
> # load the mpg dataset
```

```
> data(mpg)
```

```
>
```

```
> # i) Find the range of the disp in the data set mpg
```

```

> range_disp <- range(mpg$displ)

> print(paste0("Range of disp in the mpg dataset: ", range_disp))

[1] "Range of disp in the mpg dataset: 1.6" "Range of disp in the mpg
dataset: 7"

>

> # ii) Find the Quartile of the disp in the data set mpg

> quantiles_disp <- quantile(mpg$displ)

> print(paste0("Quartiles of disp in the mpg dataset: ", quantiles_disp))

[1] "Quartiles of disp in the mpg dataset: 1.6" "Quartiles of disp in the
mpg dataset: 2.4"

[3] "Quartiles of disp in the mpg dataset: 3.3" "Quartiles of disp in the
mpg dataset: 4.6"

[5] "Quartiles of disp in the mpg dataset: 7"

>

> # iii) Find the IQR of the disp column in the data set mpg

> iqr_disp <- IQR(mpg$displ)

> print(paste0("IQR of disp in the mpg dataset: ", iqr_disp))

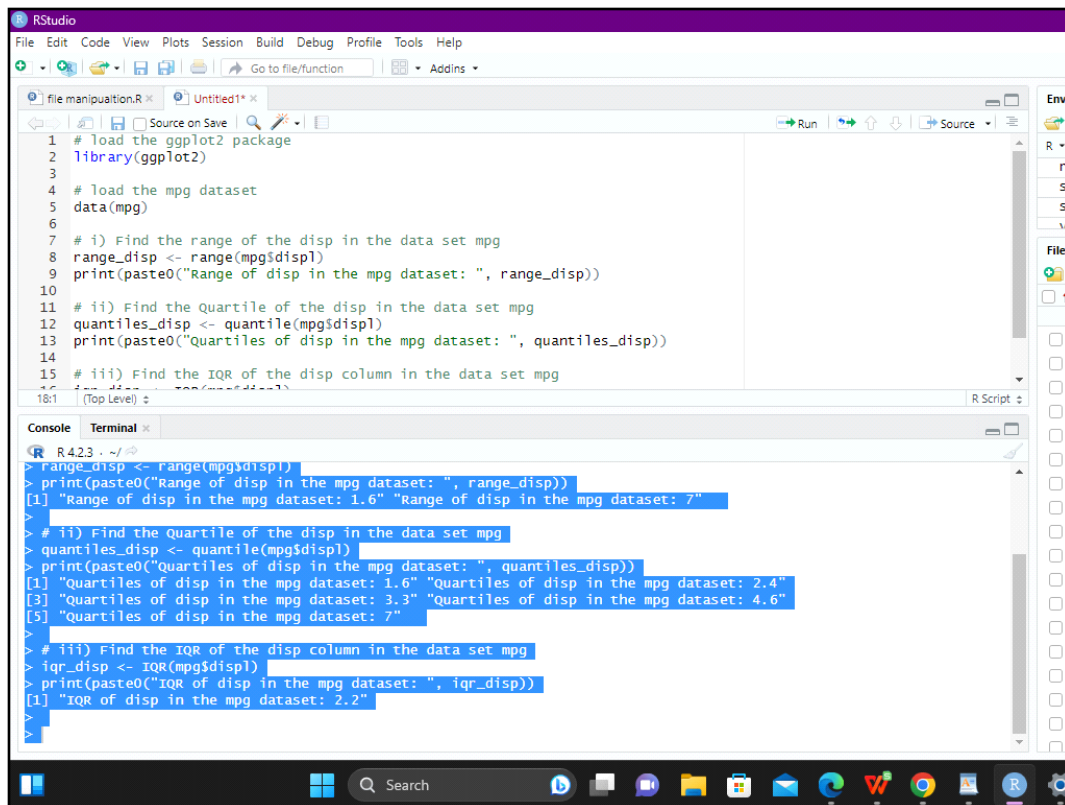
[1] "IQR of disp in the mpg dataset: 2.2"

>

>

```

SCREENSHOT:



The screenshot shows the RStudio interface. The script editor contains the following R code:

```
1 # load the ggplot2 package
2 library(ggplot2)
3
4 # load the mpg dataset
5 data(mpg)
6
7 # i) Find the range of the disp in the data set mpg
8 range_disp <- range(mpg$displ)
9 print(paste0("Range of disp in the mpg dataset: ", range_disp))
10
11 # ii) Find the quartile of the disp in the data set mpg
12 quantiles_disp <- quantile(mpg$displ)
13 print(paste0("Quartiles of disp in the mpg dataset: ", quantiles_disp))
14
15 # iii) Find the IQR of the disp column in the data set mpg
16 iqr_disp <- IQR(mpg$displ)
17 print(paste0("IQR of disp in the mpg dataset: ", iqr_disp))
```

The console shows the output of the code:

```
> range_disp <- range(mpg$displ)
> print(paste0("Range of disp in the mpg dataset: ", range_disp))
[1] "Range of disp in the mpg dataset: 1.6" "Range of disp in the mpg dataset: 7"
>
> # ii) Find the quartile of the disp in the data set mpg
> quantiles_disp <- quantile(mpg$displ)
> print(paste0("Quartiles of disp in the mpg dataset: ", quantiles_disp))
[1] "Quartiles of disp in the mpg dataset: 1.6" "Quartiles of disp in the mpg dataset: 2.4"
[3] "Quartiles of disp in the mpg dataset: 3.3" "Quartiles of disp in the mpg dataset: 4.6"
[5] "Quartiles of disp in the mpg dataset: 7"
>
> # iii) Find the IQR of the disp column in the data set mpg
> iqr_disp <- IQR(mpg$displ)
> print(paste0("IQR of disp in the mpg dataset: ", iqr_disp))
[1] "IQR of disp in the mpg dataset: 2.2"
```

Exercise 7

#Install Library

library(e1071)

a. Find the skewness of city miles per mileage in the data set mpg ?

Use qplot function and display the graph for the city miles per mileage column

b. Find the kurtosis of city miles per mileage in the data set mpg

PROGRAM:

load the ggplot2 package

library(ggplot2)

load the mpg dataset

data(mpg)

```
# a. Find the skewness of city miles per mileage in the data set mpg  
skewness_city_mpg <- skewness(mpg$cty)  
print(paste0("Skewness of city miles per gallon in the mpg dataset: ",  
skewness_city_mpg))
```

```
# plot a histogram of the city miles per gallon column  
qplot(mpg$cty, geom = "histogram", bins = 10,  
main = "City Miles Per Gallon",  
xlab = "Miles Per Gallon")
```

```
# b. Find the kurtosis of city miles per mileage in the data set mpg  
kurtosis_city_mpg <- kurtosis(mpg$cty)  
print(paste0("Kurtosis of city miles per gallon in the mpg dataset: ",  
kurtosis_city_mpg))
```

OUTPUT:

```
[1] "Skewness of city miles per gallon in the mpg dataset:  
1.75344843724469"
```

```
[1] "Kurtosis of city miles per gallon in the mpg dataset:  
3.10207663098217"
```

SCREENSHOT

