

Assignment 4

1. Install package Rcmdr and load in the R studio

```
> install.packages("Rcmdr")
WARNING: Rtools is required to build R packages but is not currently installed. Please download and install the appropriate
version of Rtools before proceeding:

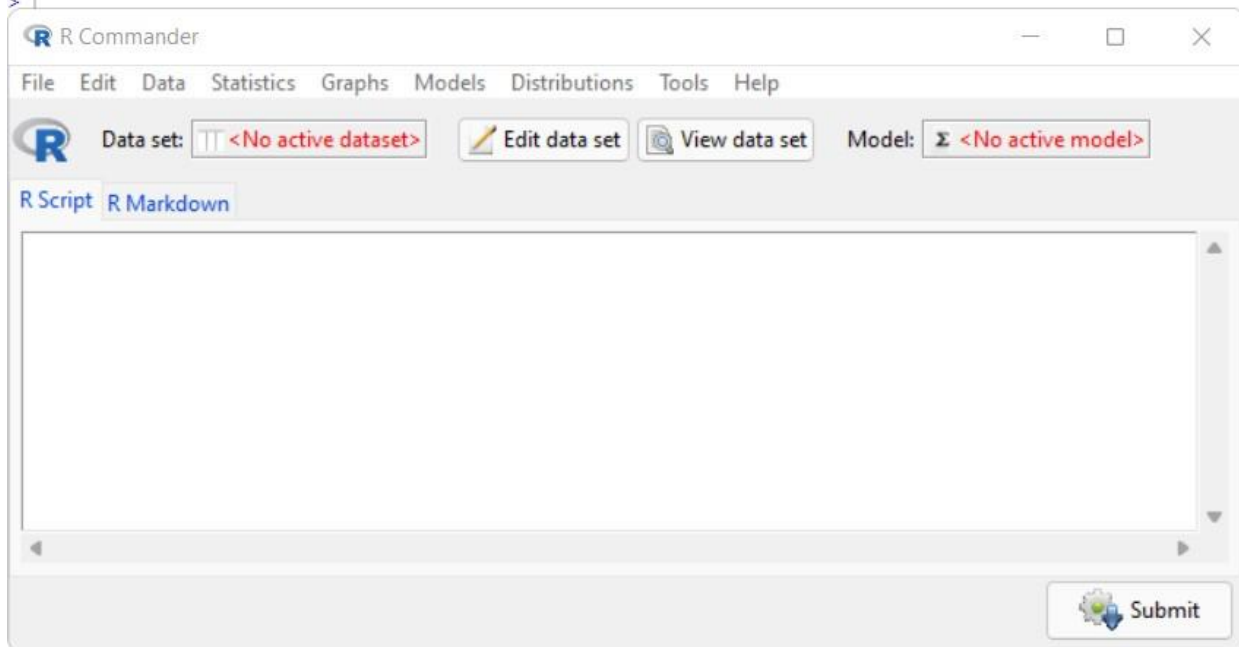
https://cran.rstudio.com/bin/windows/Rtools/
Installing package into 'C:/Users/aakas/OneDrive/Documents/R/win-library/4.0'
(as 'lib' is unspecified)
trying URL 'https://cran.rstudio.com/bin/windows/contrib/4.0/Rcmdr_2.7-2.zip'
content type 'application/zip' length 5320197 bytes (5.1 MB)
downloaded 5.1 MB

package 'Rcmdr' successfully unpacked and MD5 sums checked

The downloaded binary packages are in
C:\Users\aaakas\AppData\Local\Temp\Rtmpee1GiR\downloaded_packages
```

library(Rcmdr)

```
> library(Rcmdr)
> |
```



1. Exercise on **workspace**

- Set the current working directory
- print the current working directory
- lists files in working directory

```
> setwd("D:/MCA_R")
> getwd()
[1] "D:/MCA_R"
> dir()
character(0)
> |
```

2. Exercise on **R data types**

- Use R to calculate the following:

- 31 * 78
- ii. 697 / 41

```
> 31 * 78
[1] 2418
> 697 / 41
[1] 17
> |
```

- Assign the value of 39 to x, 22 to y and Make variable z the value of $x - y$ and display value of z on console

```
> x=39
> y=22
> z=(x-y)
> z
[1] 17
> |
```

- Checking the type of variable z

```
> typeof(z)
[1] "double"
> |
```

- Check data type of z whether it is integer or not

```
> is.integer(z)
[1] FALSE
> |
```

e. Calculate the following quantities:

i. The sum of 100.1, 234.9 and 12.01.

```
> a<-c(100.1,234.9,12.01)
> sum(a)
[1] 347.01
> |
```

ii. The square root of 256

```
> sqrt(256)
[1] 16
> |
```

iii. Calculate the 10-based logarithm of 100, and multiply the result with the cosine of π . Hint: see ? log and ? pi.

```
> log10(100)*cos(pi)
[1] -2
> |
```

iv. Calculate the square root of 2345, and perform a log2 transformation on the result.

```
> sqrt(2345)
[1] 48.4252
> log2(48.4252)
[1] 5.597686
> |
```

4.Exercise on Vector

a. Create a vector x using : operator and display the value of dim(x) and length(x)

```
> x<-c(12,34,23,44,69)
> dim(x)
NULL
> length(x)
[1] 5
> |
```

b. Consider two vectors, x, y x=c(4,6,5,7,10,9,4,15) y=c(0,10,1,8,2,3,4,1) What is the value of: x*y and x+y

```
> x=c(4,6,5,7,10,9,4,15)
> y=c(0,10,1,8,2,3,4,1)
> x*y
[1] 0 60 5 56 20 27 16 15
> x+y
[1] 4 16 6 15 12 12 8 16
> |
```

c. Consider two vectors, a, b a=c(1,5,4,3,6) b=c(3,5,2,1,9) What is the value of: a<=b

```
> a=c(1,5,4,3,6)
> b=c(3,5,2,1,9)
> a<=b
[1] TRUE TRUE FALSE FALSE TRUE
> |
```

d. If $x=c('blue', 'red', 'green', 'yellow')$ check for the datatype of vector x and check whether it is character data type or not.

```
> x=c('blue', 'red', 'green', 'yellow')
> is.integer(x)
[1] FALSE
> is.character(x)
[1] TRUE
> |
```

e. Consider two vectors, a , b $a=c(10,2,4,15)$ $b=c(3,12,4,11)$ What is the value of: $rbind(a,b)$ and $cbind(a,b)$

```
> rbind(a,b)
  [,1] [,2] [,3] [,4]
a   10    2    4   15
b    3   12    4   11
> cbind(a,b)
      a  b
[1,] 10  3
[2,]  2 12
[3,]  4  4
[4,] 15 11
> |
```

f. The numbers below are the first ten days of rainfall amounts in 1996. Read them in to a vector using the $c()$ function 0.1, 0.6, 33.8, 1.9, 9.6, 4.3, 33.7, 0.3, 0.0, 0.1. What was the mean rainfall, how about the standard deviation?

```
> w<-c(0.1, 0.6, 33.8, 1.9, 9.6, 4.3, 33.7, 0.3, 0.0, 0.1)
> mean(w)
[1] 8.44
> SD(w)
Error in SD(w) : could not find function "SD"
> sd(w)
[1] 13.66473
> |
```

g. The weights of five people before and after a diet programme are given in the table. Read the 'before' and 'after' values into two different vectors called before and after.

Before	78	72	78	79	105
After	67	65	79	70	93

Use R to evaluate the amount of weight lost for each participant. What is the average amount of weight lost?

```
> before<-c(78,72,78,79,105)
> after<-c(67,65,79,70,93)
> a(before-after)
Error in a(before - after) : could not find function "a"
> a=(before-after)
> mean(a)
[1] 7.6
> |
```

5. Exercise on Matrix

a. Construct the following matrix A and check dimension and attribute of this created matrix

$$\begin{bmatrix} 1 & 3 \\ 2 & 4 \end{bmatrix}$$

```
> Z<-array(1:4,c(2,2))
> dim(Z)
[1] 2 2
> attributes(z)
$dim
[1] 2 2

> |
```

b. Construct another matrix B

$$\begin{bmatrix} 12 & 32 \\ 12 & 24 \end{bmatrix}$$

```
> B<-matrix(c(12,12,32,24),nrow = 2 , ncol= 2)
> B
      [,1] [,2]
[1,]   12   32
[2,]   12   24
```

c. Calculate the following from above matrices A and B

i. A+B ii. A-B iii. A%*%B iv. A*B

```
> Z*B
      [,1] [,2]
[1,]   12   96
[2,]   24   96
>
> Z+B
      [,1] [,2]
[1,]   13   35
[2,]   14   28
> Z-B
      [,1] [,2]
[1,]  -11  -29
[2,]  -10  -20
> Z%*%B
      [,1] [,2]
[1,]   48  104
[2,]   72  160
> Z-B
      [,1] [,2]
[1,]  -11  -29
[2,]  -10  -20
```

d. Calculate the transpose and determinant of matrix A

```
> t(Z)
      [,1] [,2]
[1,]     1     2
[2,]     3     4
> det(Z)
[1] -2
> |
```

e. Use cbind() to add column values (5,6) and rbind() to add row values (3,1) to matrix A and observe the result

```

> A<-array(1:4,c(2,2))
> A
      [,1] [,2]
[1,]    1    3
[2,]    2    4
> cbind(A,c(5,6))
      [,1] [,2] [,3]
[1,]    1    3    5
[2,]    2    4    6
> rbind(A,c(5,6))
      [,1] [,2]
[1,]    1    3
[2,]    2    4
[3,]    5    6
> |

```

6. Exercise on Factor

- a. 1 If $x = c(1, 2, 3, 3, 5, 3, 2, 4, NA)$, what are the levels of $\text{factor}(x)$?

```

> x= c(1, 2, 3, 3, 5, 3, 2, 4, NA)
> factor(x)
[1] 1 2 3 3 5 3 2 4 <NA>
Levels: 1 2 3 4 5
> |

```

- b. If $z <- c("p", "a", "g", "t", "b")$, then What is the R expression will re place the third element in z with "b".

```

Console Terminal × Jobs ×
D:/MCA_R/
> z <- c("p", "a", "g", "t", "b")
> z
[1] "p" "a" "g" "t" "b"
> y<-replace(z,3,"q")
> y
[1] "p" "a" "q" "t" "b"
> |

```

- c. If $z <- \text{factor}(c("p", "q", "p", "r", "q"))$ and levels of z are "p", "q", "r", write an R expression that will change the level "p" to "w" so that z is equal to: "w", "q", "w", "r", "q".

```

> z <- (c("p", "q", "p", "r", "q"))
> factor(z)
[1] p q p r q
Levels: p q r
> y<-replace(z,z=="p","w")
> yu
Error: object 'yu' not found
> y
[1] "w" "q" "w" "r" "q"
> |

```

- d. If: $s1 <- \text{factor}(\text{sample}(\text{letters}, \text{size}=5, \text{replace}=\text{TRUE}))$ and $s2 <- \text{factor}(\text{sample}(\text{letters}, \text{size}=5, \text{replace}=\text{TRUE}))$, write an R expression that will concatenate $s1$ and $s2$ in a single factor with 10 elements.

```

Console Terminal x Jobs x
D:/MCA_R/ ↗
> s1 <- factor(sample(letters, size=5, replace=TRUE))
> s1
[1] m y b f l
Levels: b f l m y
> s2 <- factor(sample(letters, size=5, replace=TRUE))
> s2
[1] k h h c d
Levels: c d h k
> level1<-levels(s1)
> level2<-levels(s2)
> s3<-factor(c(level1,level2))
> s3
[1] b f l m y c d h k
Levels: b c d f h k l m y
> |

```

7. Exercise on DataFrame

- a. Create the following “Student” data frame

```

Console Terminal x Jobs x
D:/MCA_R/ ↗
> Name <- c("Alex", "Lilly", "Mark", "oliver", "Martha", "Lucas", "Caroline")
> Height <- c(177, 163, 190, 179, 163, 183, 164)
> weight <- c(57, 69, 83, 75, 70, 83, 53)
> Sex <- as.factor(c("F", "F", "M", "M", "F", "M", "F"))
>
> df <- data.frame (row.names = Name, Age, Height, weight, Sex)
> df
      Age Height weight Sex
Alex    25    177     57  F
Lilly   31    163     69  F
Mark    23    190     83  M
oliver  52    179     75  M
Martha  76    163     70  F
Lucas   49    183     83  M
Caroline 26    164     53  F
> |

```

- b. Create this data frame (make sure you import the variable working as character and not factor).
”

```

Caroline 26    164     53  F
> s1<-data.frame(row.names = Name,work)
> s1
      work
Alex    Yes
Lilly   No
Mark    No
oliver  Yes
Martha  Yes
Lucas   No
Caroline Yes
> |

```

- c. Add this data frame column-wise to the previous one table.
i. How many rows and columns does the new data frame have?

```

Console | terminal x | Jobs x
D:/MCA_R/
> w= cbind(df,s1)
> w
      Age Height weight Sex work
Alex   25   177    57   F   Yes
Lilly  31   163    69   F    No
Mark   23   190    83   M    No
Oliver 52   179    75   M   Yes
Martha 76   163    70   F   Yes
Lucas  49   183    83   M    No
Caroline 26  164    53   F   Yes

```

ii. What class of data is in each column?

```

> lapply(w,class)
$Age
[1] "numeric"

$Height
[1] "numeric"

$weight
[1] "numeric"

$Sex
[1] "factor"

$work
[1] "character"

```

iii. Access only Height column and display it

```

> data.frame(df$Height)
  df.Height
1      177
2      163
3      190
4      179
5      163
6      183
7      164
> |

```

iv. Display total rows and cols in table

```

> nrow(w)
[1] 7
> ncol(w)
[1] 5
> |

```

d. Create empty dataframe having columns Name and Age with data type character and numeric respectively.


```

Console Terminal x Jobs x
D:/MCA_R/ ↗
> data <- data.frame(Name=character(), Age=numeric())
> data
[1] Name Age
<0 rows> (or 0-length row.names)
> |

```

8. Create above **Student** table using **table** command.

```

> w
table.table.Age table.table.Height table.table.weight table.table.Sex table.table.work
Alex           25           177           57           F           Yes
Lilly          31           163           69           F           No
Mark           23           190           83           M           No
Oliver         52           179           75           M           Yes
Martha         76           163           70           F           Yes
Lucas          49           183           83           M           No
Caroline       26           164           53           F           Yes
> |

```

9. Exercise on List

a. If: `p <- c(2,7,8)`, `q <- c("A", "B", "C")` and `x <- list(p, q)`, then what is the value of `x[2]`?

```

Console Terminal x Jobs x
D:/MCA_R/ ↗
> p <- c(2,7,8)
> q <- c("A", "B", "C")
> x <- list(p, q)
> x[2]
[[1]]
[1] "A" "B" "C"
> |

```

b. If `Newlist <- list(a=1:10, b="Good morning", c="Hi")`, write an R statement that will add 1 to each element of the first vector in `Newlist`.

```

> Newlist <- list(a=1:10, b="Good morning", c="Hi")
> Newlist$a=Newlist$a+1
> Newlist
$a
[1] 2 3 4 5 6 7 8 9 10 11

$b
[1] "Good morning"

$c
[1] "Hi"
> |

```

10. Exercise on Reading and writing .csv file

a. Load comm separated .csv file in R studio and check dimensions of loaded data

```
> dataT<-read.table("user.csv",sep = ",")
> dataT
```

	V1	V2	V3	V4	V5	V6	V7
	userid	date_start	day_of_week_start	hour_start	min_start	time_status	date_end
1	5967	1/10/2011	2	10	56	M	1/10/2011
2	5967	1/11/2011	3	6	24	M	1/11/2011
3	5967	1/11/2011	3	10	56	M	1/11/2011
4	5967	1/11/2011	3	12	8	N	1/11/2011
5	5967	1/11/2011	3	16	49	A	1/11/2011
6	5967	1/12/2011	4	1	0	M	1/12/2011

b.Check first few rows of the inserted data

```
Console Terminal x Jobs x
D:/MCA_R/
> dim(dataT)
[1] 103 13
> |
```

c.Check last few rows of the inserted data

```
> tail(dataT,2)
```

	V1	V2	V3	V4	V5	V6	V7	V8	V9	V10	V11	V12	V13
102	5967	3/26/2011	7	16	0	A	3/26/2011	7	16	15	0	15	P1
103	5967	3/26/2011	7	16	16	A	3/26/2011	7	17	0	0	44	P4

```
> |
```

d.create data frame and save data in test.csv file

```
Console Terminal x Jobs x
D:/MCA_R/
> p<-data.frame(a=77,b=56,c=pi)
> write.csv(p,file = "test.csv")
> read.csv("test.csv")
  x  a  b  c
1 1 77 56 3.141593
> |
```

11. Exercise on Reading and writing excel file

a. Load .xlsx file in R studio data frame

```
> df<-XLConnect::readWorksheetFromFile("staff_excel.xls",sheet=1)
```

- b. Display all columns and selected rows

```
> df<-XLConnect::readworksheetFromFile("staff_excel.xls",sheet=1)
> df
  ID First.Name Last.Name Street City State ZipCode Age
1  1      Mary      Joe Thakur Marg Mumbai Maharashtra 400101 5
2  2        Ram    Singh LT Marg Baroda Gujarat 400206 15
3  3    Akshay    Kumar SV Road Lucknow UP 400207 25
4  4     Viraj    Gupta Linking Road Jaipur Rajasthan 400203 11
5  5     Samay  Khurana WE highway Nagpur Maharashtra 400102 18
> |
```

- c. Reading and writing data using ReadXL and WriteXL command

```
> writexl::write_xlsx(df,'universities.xlsx')
> readxl::read_xlsx('universities.xlsx')
# A tibble: 5 x 8
  ID First.Name Last.Name Street City State ZipCode Age
<dbl> <chr> <chr> <chr> <chr> <chr> <dbl> <dbl>
1 1 Mary Joe Thakur Marg Mumbai Maharashtra 400101 5
2 2 Ram Singh LT Marg Baroda Gujarat 400206 15
3 3 Akshay Kumar SV Road Lucknow UP 400207 25
4 4 Viraj Gupta Linking Road Jaipur Rajasthan 400203 11
5 5 Samay Khurana WE highway Nagpur Maharashtra 400102 18
> |
```