QUIZ 1

Please copy and paste your codes and outputs from R Console to word file, if you do not know how to use R Notebook, R Markdown or Quarto. The name of the solution files has to be your name and surname. Then, send it to ozanstat@gmail.com.

This quiz is mandatory to get a certificate from the course organizers.

1. a) Please fill in the blanks.

I) Vectors in R are created by using ..... command.
II) Both ..... and ..... commands are used to create a matrix in R.
III) Vectors are combined with ..... command to create a data frame in R.

b) Use the command line in R to get help on the following commands. Briefly describe the purpose of each command.

I) which()
II) sort()

2. Create the following series by using seq() and rep() functions.

a) 1 3 5 7 9
b) 8.0 10.4 12.8 15.2 17.6 20.0
c) 1, 2, 3, 4, 1, 2, 3, 4, 1, 2, 3, 4
d) 1, 1, 1, 2, 2, 2, 3, 3, 3, 4, 4, 4

3. Assume that we have registered the height and weight for six people: Heights in cm are 180, 165, 160, 193, 175,156; weights in kg are 87, 58, 65, 100,80,60.

a) Make two vectors, height and weight, with the data.

b) Calculate the means and standard deviations of these two vectors.

d) How many people are above the average height value? (**Hint:** Do not count it ☺ Use logical operators☺)

e) How many people are below the average weight value? (**Hint:** Do not count it ☺ Use logical operators☺)

f) What are the maximum and minimum weights?

g) What are the maximum and minimum heights?

h) The body mass index (BMI) is defined as

$$\frac{\boldsymbol{Weight\ in\ kg}}{(\boldsymbol{Height\ in\ m})\mathbf{2}}$$

Ozdemir, O.
Room No: 234
e-mail: ozancan@metu.edu.tr

Make a vector with the BMI values for the four people, and a vector with the natural logarithm to the BMI values. Finally make a vector with the weights for those people who have a BMI larger than 25.

4. Create in R the matrices

$$X=\begin{bmatrix} 3 & 2 \\ -1 & 1 \end{bmatrix} \text{ and } Y=\begin{bmatrix} 1 & 4 & 0 \\ 0 & 1 & -1 \end{bmatrix}$$

Calculate 2*X, X*X, X%*%X, X*%*Y, t(y), solve(x)

5. Given the matrix

$$A=\begin{vmatrix} 6 & 5 & 9 & 1 \\ 1 & 8 & 8 & 1 \\ 1 & 9 & 2 & 3 \\ 1 & 9 & 3 & 8 \end{vmatrix}$$

Explain the results of the following commands:

a) Take the transpose of A

b) Show first first and third columns of A

c) Show second and fourth rows of matrix A

d) Calculate the determinant of matrix A

e) Extract the element at (2,1) position in the matrix

f) Extract upper-right 2x2 submatrix from given A matrix

6. Create the following dataset using `data.frame()` command in R

```
  name survey location floors efficiency
1 bldg1      1        1      5         51
2 bldg2      1        2     10         64
3 bldg3      1        3     10         70
4 bldg4      2        2     11         71
5 bldg5      2        3      8         80
6 bldg6      2        1     12         58
```

a) Check the dimension of the dataset.

b) Create a new dataset without name information

c) Create a new dataset that shows only location, floors and efficiency.

d) Which building's efficiency is greater than 50?

Ozdemir, O. Room No: 234
e-mail: ozancan@metu.edu.tr

e) Select the names of buildings with floors more than or equal to 10.

f) Assume that the efficiency of last building is 78, but you type it as 58. Correct it as 78.

g) Export this dataset by using `write.table()` command

7. Calculate the $\sum_{i=0}^{n=30} i^2$ by using for loop.

8. Write down a code to obtain first 12 Fibonacci numbers. Hint: The Fibonacci sequence is a famous sequence in mathematics. The first two elements are defined as 1. Subsequent elements are defined as the sum of preceding two elements. For example, the third element is 2 (=1+1), the forth element is 3 (=1+2) and soon.

9. Please write a for loop to construct the given matrix.

$$\begin{bmatrix} 1 & 3 & 4 & 5 & 6 & 7 \\ 3 & 1 & 5 & 6 & 7 & 8 \\ 4 & 5 & 1 & 7 & 8 & 9 \\ 5 & 6 & 7 & 1 & 9 & 10 \\ 6 & 7 & 8 & 9 & 1 & 11 \\ 7 & 8 & 9 & 10 & 11 & 1 \end{bmatrix}$$

10. Please write a R function which returns the result of the following function for a given input number.

$$f(x) = \begin{cases} 3x + 2 & , x \leq 3 \\ 2x - 0.5x^2 & , x > 3 \end{cases}$$

11. Write a function that returns a factorial of the number. For example `function(4) = 24.`

Ozdemir, O. Room No: 234
e-mail: ozancan@metu.edu.tr