

SESSION 3: FOUNDATIONALR PROGRAMMING

Assignment 1

1. Define an $m \times n$ matrix of zeros and then enters a nested-for loop to fill the locations of the matrix, only if the two indexes differ.

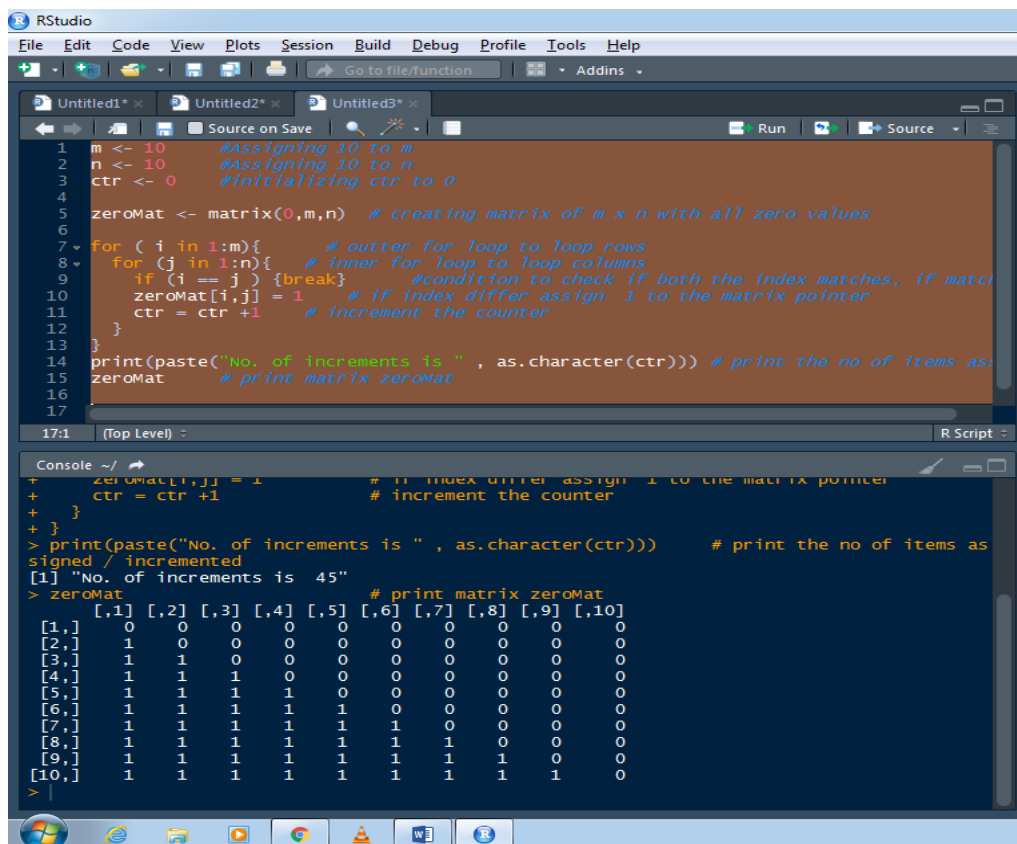
- The purpose is to create a lower triangular matrix, that is a matrix whose elements below the main diagonal are non-zero, the others are left untouched to their initialized zero value.
- When the indexes are equal (if condition in the inner loop, which runs over j , the column index), a break is executed and the innermost loop is interrupted with a direct jump to the instruction following the inner loop, which is a print; then control gets to the outer for condition (over the rows, index i), which is evaluated again.
- If the indexes differ, the assignment is performed and the counter is incremented by 1.
- At the end, the program prints the counter ctr , which contains the #number of elements that were assigned.

Answer:

```
m <- 10          #Assigning 10 to m
n <- 10          #Assigning 10 to n
ctr <- 0         #initializing ctr to 0
zeroMat <- matrix(0,m,n) # creating matrix of m x n with all zero values

for ( i in 1:m){          # outter for loop to loop rows
  for (j in 1:n){          # inner for loop to loop columns
    if (i == j) {break}    #condition to check if both the index matches, if match exit inner for loop
    zeroMat[i,j] = 1       # if index differ assign 1 to the matrix pointer
    ctr = ctr +1           # increment the counter
  }
}

print(paste("No. of increments is " , as.character(ctr))) # print the no of items assigned / incremented
zeroMat           # print matrix zeroMat
```



The screenshot shows the RStudio interface with a script editor and a console. The script editor contains the R code from the previous block. The console shows the output of the script, including the assignment of values to the matrix and the final print statement.

```
17:1 (Top Level) : R Script :
+ zeroMat[i,j] = 1          # if index differ assign 1 to the matrix pointer
+ ctr = ctr +1             # increment the counter
+ }
+ }
> print(paste("No. of increments is " , as.character(ctr))) # print the no of items as
signed / incremented
[1] "No. of increments is 45"
> zeroMat                  # print matrix zeroMat
     [,1] [,2] [,3] [,4] [,5] [,6] [,7] [,8] [,9] [,10]
[1,]  0    0    0    0    0    0    0    0    0    0
[2,]  1    0    0    0    0    0    0    0    0    0
[3,]  1    1    0    0    0    0    0    0    0    0
[4,]  1    1    1    0    0    0    0    0    0    0
[5,]  1    1    1    1    0    0    0    0    0    0
[6,]  1    1    1    1    1    0    0    0    0    0
[7,]  1    1    1    1    1    1    0    0    0    0
[8,]  1    1    1    1    1    1    1    0    0    0
[9,]  1    1    1    1    1    1    1    1    0    0
[10,] 1    1    1    1    1    1    1    1    1    0
```