

# STATISTICS WITH R PROGRAMMING FOR VISUALIZATION

**COURSE CODE: ITA0435**

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- ### 1. Create numeric, character, and logical vectors and display type and content.

**CODE:**

```
num vec <- c(10, 20, 30)
```

```
char vec <- c("A", "B", "C")
```

```
log_vec <- c(TRUE, FALSE, TRUE)
```

```
print(num_vec)
```

```
print(char_vec)
```

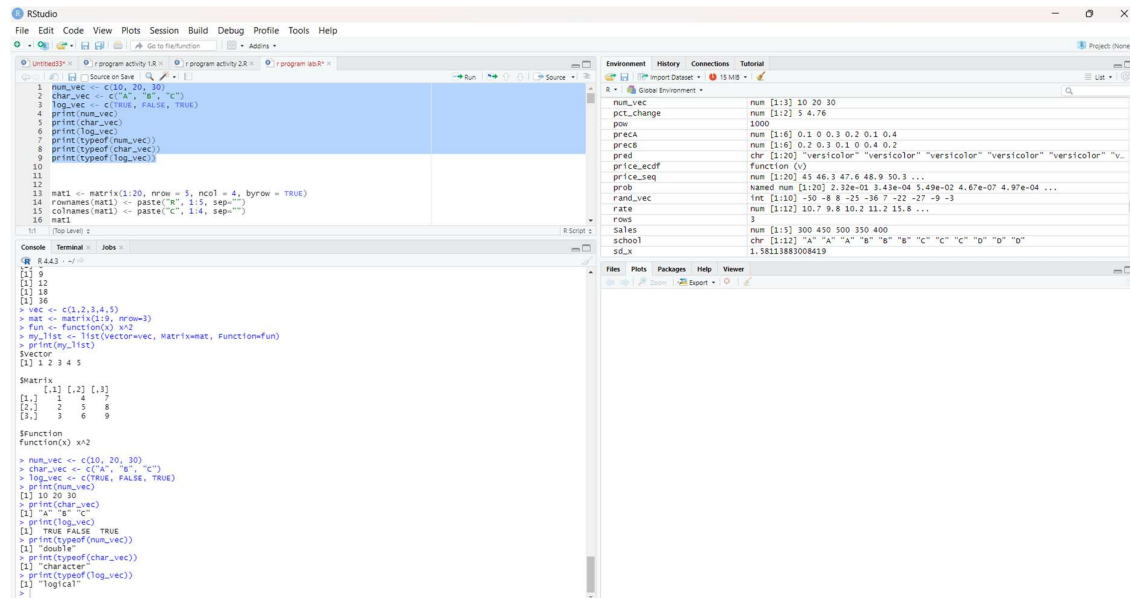
```
print(log_vec)
```

```
print(typeof(num_vec))
```

```
print(typeof(char_vec))
```

```
print(typeof(log vec))
```

**OUTPUT:**



- 2. Create labeled matrices (5×4, 3×3, 2×2) filled by row/column.**

**CODE:**

```
mat1 <- matrix(1:20, nrow = 5, ncol = 4, byrow = TRUE)
```

```
rownames(mat1) <- paste("R", 1:5, sep="")
```

```
colnames(mat1) <- paste("C", 1:4, sep="")
```

mat1

```
mat2 <- matrix(1:9, nrow = 3, ncol = 3)
```

```
rownames(mat2) <- paste("R", 1:3, sep="")
```

```
colnames(mat2) <- paste("C", 1:3, sep="")
```

mat2

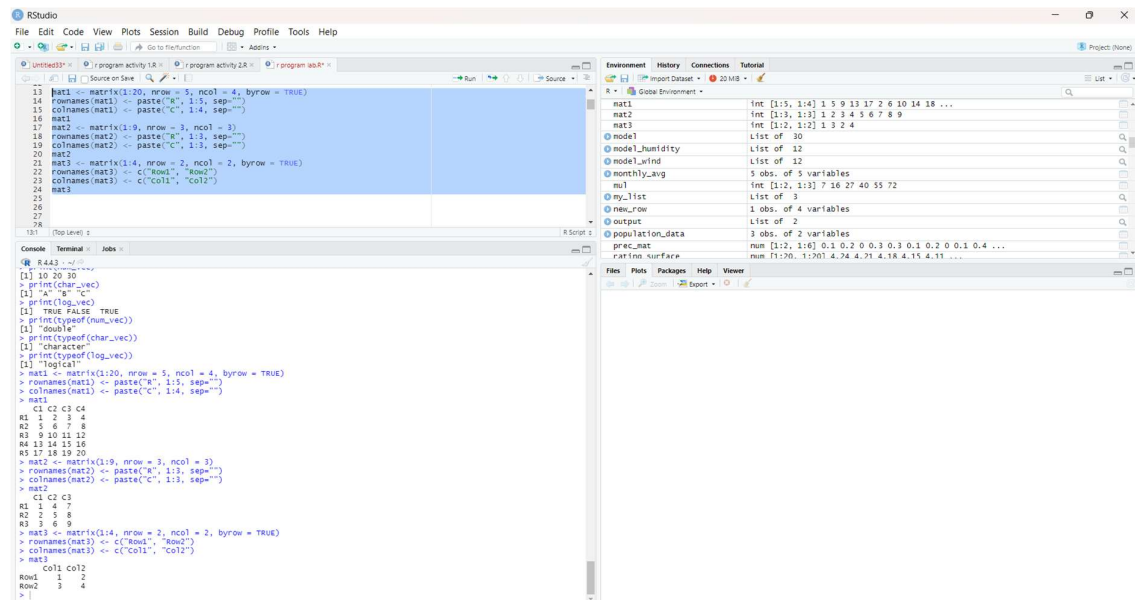
```
mat3 <- matrix(1:4, nrow = 2, ncol = 2, byrow = TRUE)
```

```
rownames(mat3) <- c("Row1", "Row2")
```

```
colnames(mat3) <- c("Col1", "Col2")
```

mat3

## OUTPUT:



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

```
13 mat1 <- matrix(1:20, nrow = 5, ncol = 4, byrow = TRUE)
14 rownames(mat1) <- paste("R", 1:5, sep="")
15 colnames(mat1) <- paste("C", 1:4, sep="")
16 mat1
17 mat2 <- matrix(1:9, nrow = 3, ncol = 3)
18 rownames(mat2) <- paste("R", 1:3, sep="")
19 colnames(mat2) <- paste("C", 1:3, sep="")
20 mat2
21 mat3 <- matrix(1:4, nrow = 2, ncol = 2, byrow = TRUE)
22 rownames(mat3) <- c("Row1", "Row2")
23 colnames(mat3) <- c("Col1", "Col2")
24 mat3
```

The console on the bottom left shows the output of the code:

```
R 4.4.3 ~ /...
> print(char_vec)
[1] 10 20 30
> print(char_vec)
[1] "a" "b" "c"
> print(log_vec)
[1] TRUE FALSE TRUE
> print(typeof(num_vec))
[1] "double"
> print(typeof(char_vec))
[1] "character"
> print(typeof(log_vec))
[1] "logical"
> mat1 <- matrix(1:20, nrow = 5, ncol = 4, byrow = TRUE)
> rownames(mat1) <- paste("R", 1:5, sep="")
> colnames(mat1) <- paste("C", 1:4, sep="")
> mat1
      C1 C2 C3 C4
R1    1  2  3  4
R2    5  6  7  8
R3    9 10 11 12
R4   13 14 15 16
R5   17 18 19 20
> mat2 <- matrix(1:9, nrow = 3, ncol = 3)
> rownames(mat2) <- paste("R", 1:3, sep="")
> colnames(mat2) <- paste("C", 1:3, sep="")
> mat2
      C1 C2 C3
R1    1  4  7
R2    2  5  8
R3    3  6  9
> mat3 <- matrix(1:4, nrow = 2, ncol = 2, byrow = TRUE)
> rownames(mat3) <- c("Row1", "Row2")
> colnames(mat3) <- c("Col1", "Col2")
> mat3
      Col1 Col2
Row1    1    2
Row2    3    4
```

The Environment pane on the right shows the objects created:

- mat1: int [1:5, 1:4] 1 5 9 13 17 2 6 10 14 18 ...
- mat2: int [1:3, 1:3] 1 2 3 4 5 6 7 8 9
- mat3: int [1:2, 1:2] 1 3 2 4
- model: List of 30
- model\_humidity: List of 12
- model\_wind: List of 12
- monthly\_avg: 5 obs. of 5 variables
- mu1: int [1:2, 1:3] 7 16 27 40 55 72
- my\_list: List of 3
- new\_row: 1 obs. of 4 variables
- output: List of 2
- population\_data: 3 obs. of 2 variables
- prec\_mat: num [1:2, 1:6] 0.1 0.2 0 0.3 0.3 0.1 0.2 0 0.1 0.4 ...
- ratios\_surface: num [1:20, 1:20] 4.74 4.71 4.18 4.15 4.11 ...

## 3. Write an R program to create and display a 3D array with specified rows, columns, and tables.

### CODE:

```
rows <- 3
```

```
cols <- 3
```

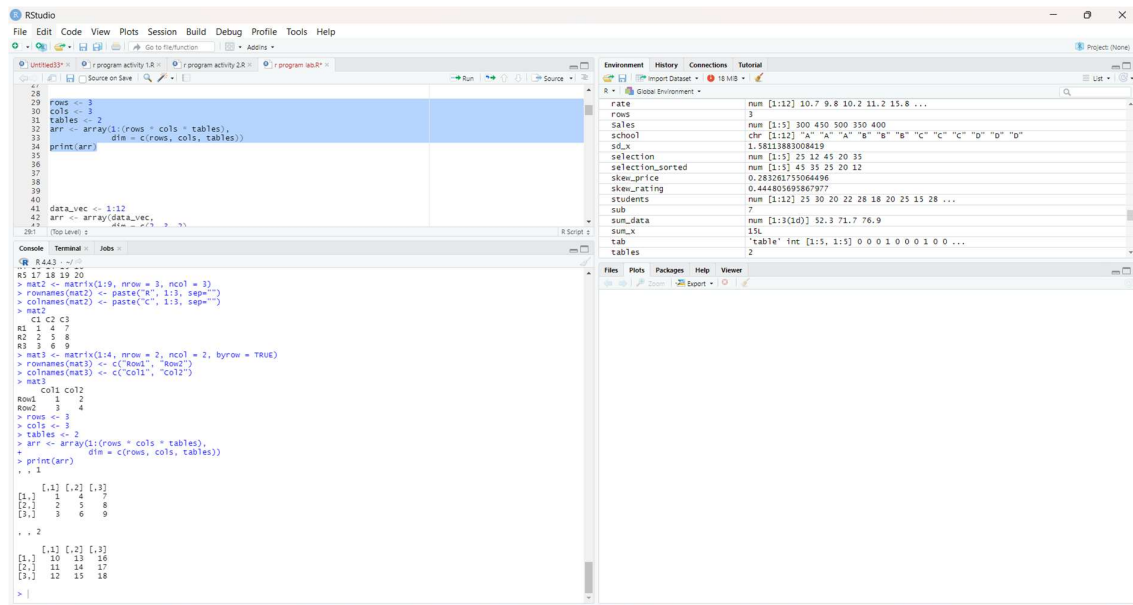
```
tables <- 2
```

```
arr <- array(1:(rows * cols * tables),
```

```
dim = c(rows, cols, tables))
```

```
print(arr)
```

### OUTPUT:



#### 4. Create arrays from vectors with dimension names, print specific elements.

##### CODE:

```
data_vec <- 1:12
```

```
arr <- array(data_vec,
```

```
  dim = c(2, 3, 2),
```

```
  dimnames = list(
```

```
    Row = c("R1", "R2"),
```

```
    Column = c("C1", "C2", "C3"),
```

```
    Table = c("T1", "T2")
```

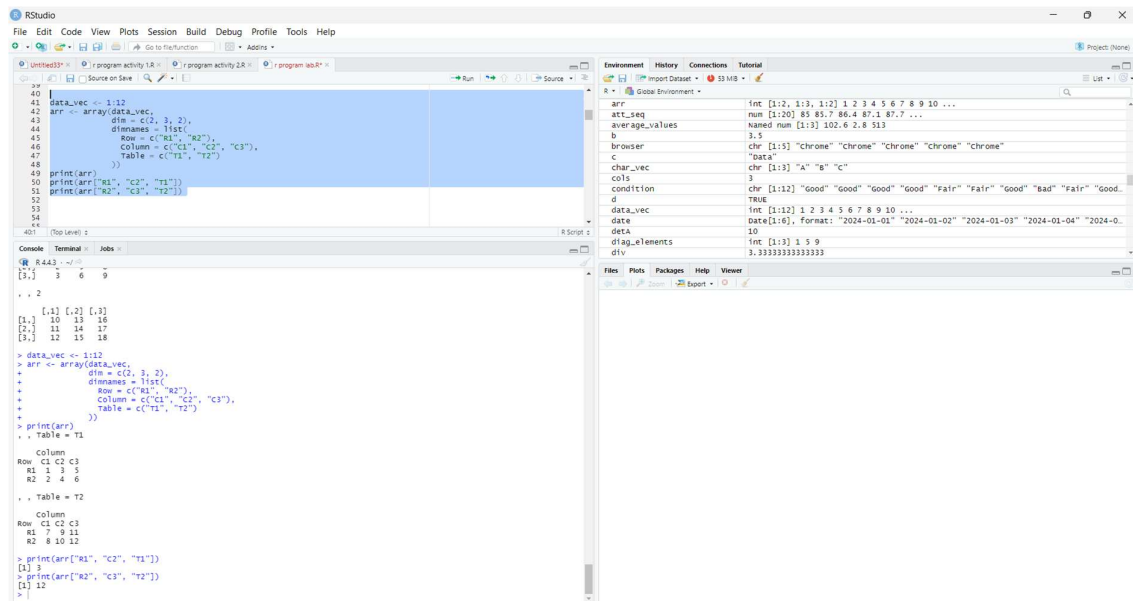
```
  ))
```

```
print(arr)
```

```
print(arr["R1", "C2", "T1"])
```

```
print(arr["R2", "C3", "T2"])
```

##### OUTPUT:



## 5. Create and manipulate factor variables (e.g., women's dataset heights, random LETTERS sample).

### CODE:

```
data(women)
```

```
height_group <- factor(
  ifelse(women$height < 65, "Short",
         ifelse(women$height <= 70, "Medium", "Tall"))
)
```

```
print(height_group)
```

```
levels(height_group)
```

```
set.seed(1)
```

```
letters_sample <- sample(LETTERS[1:5], 10, replace = TRUE)
```

```
letters_factor <- factor(letters_sample)
```

```
print(letters_factor)
```

```
levels(letters_factor)
```

```
table(letters_factor)
```

### OUTPUT:

RStudio

File Edit Code View Plots Session Build Debug Profile Tools Help

Source | Run | Go to function | Addins

```
57  
58 data(women)  
59 height_group <- factor(  
60   ifelse(women$height <= 65, "short",  
61   ifelse(women$height <= 70, "medium", "tall"))  
62 )  
63 print(height_group)  
64 levels(height_group)  
65 set.seed(1)  
66 letters_sample <- sample(LETTERS[1:5], 10, replace = TRUE)  
67 letters_factor <- factor(letters_sample)  
68 print(letters_factor)  
69 levels(letters_factor)  
70 table(letters_factor)  
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```

Environment | History | Connections | Tutorial

Global Environment

women 15 obs. of 2 variables

year\_population\_data 5 obs. of 2 variables

Values

a 10

age\_seq num [1:20] 22 23.5 24.9 26.4 27.9 ...

arr int [1:2, 1:3, 1:2] 1 2 3 4 5 6 7 8 9 10 ...

att\_seq num [1:20] 85 85.7 86.4 87.1 87.7 ...

average\_values named num [1:3] 102.6 2.8 533

b 5.5

browser chr [1:5] "chrome" "chrome" "chrome" "chrome" "chrome"

c "data"

char\_vec chr [1:3] "a" "b" "c"

cols 3

condition chr [1:12] "Good" "Good" "Good" "Good" "Fair" "Fair" "Good" "Bad" "Fair" "Good"

d TRUE

Files | Plots | Packages | Help | Viewer

Source | Run | Go to function | Addins

Console | Terminal | Jobs

```
R 4.4.3 ~ /  
R1 1 1 1  
R2 2 4 6  
R3 2 4 6  
R4 2 4 6  
R5 2 4 6  
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