



Finolex Academy of Management and Technology, Ratnagiri

Department of Information Technology

Subject:	R Programming Lab. (ITL804)		
Class:	BE IT / Semester – VIII (Rev-2016) / Academic year: 2019-20		
Name of Student:	Kazi Jawwad A Rahim		
Roll No:	28	Date of performance (DOP) :	17/01/2020
Assignment/Experiment No:	02	Date of checking (DOC) :	29/03/2020
Title: Program to demonstrate data structures such as- vectors, matrix, list and data frames.			
Marks:	08	Teacher's Signature:	

1. Aim: To understand the use of vectors, matrix, list and data frames in R.

2. Prerequisites:

1. Basics of R programming.

3. Hardware Requirements:

1. PC with minimum 2GB RAM

4. Software Requirements:

1. Windows / Linux OS.
2. R version 3.6 or higher

5. Learning Objectives:

1. To understand vectors, matrix and lists.
2. To understand *data frames* which are mainly required for data analysis in R.

6. Learning Objectives Applicable: LO 1, LO 2

7. Program Outcomes Applicable: PO 1

8. Program Education Objectives Applicable: PEO 1, PEO 2



Theory:

Vectors, Array, List & Dataframe are 4 basic data types defined in R.

i) Vector -

All elements must be of the same type. When you want to create vector with more than one element, you should use ~~c()~~ `c()` function which means to combine the elements into a vector for e.g.,

```
# Create a vector
```

```
apple <- c('red', 'green', "yellow")  
print(apple)
```

```
# Get the class of the vector  
print(class(apple))
```

ii) Array and Matrix -

i) Matrix - is a special kind of vector. A matrix is a vector with two additional attributes: the no of rows and the number of columns.

```
# Create a matrix
```

```
M = matrix(c('a', 'a', 'b', 'c', 'b', 'a'), nrow=2,  
           ncol=3, byrow=TRUE)  
print(M)
```

iii) Array -

While matrices are confined to two dimensions. The array functions takes a



dim attributes which creates the required number of dimension.

Create an array -

```
a <- array(c('green', 'yellow'), dim = c(3, 3, 2))  
print(a)
```

3) List -

A list is an R-object which can obtain many different types of elements inside it like Vectors, functions, and even another list inside it.

Create a list

```
list1 <- list(c(2, 5, 3), 27.3, sin)  
print(list1)
```

4) Data Frames -

Data frames are tabular data objects. Unlike a matrix in data frame each column can contain different modes of data. The first column can be numeric while the second ~~can~~ column can be character and third column can be logical. It is a list of vectors of equal length. Data frames are created using the data.frame() function.

Create the data frame:

```
BMI <- data.frame()
```

```
gender = c("Male", "Male", "Female"),
```

```
height = c(152, 173, 165),
```

```
weight = c(70, 75, 80),
```

```
age = c(40, 41, 42))
```

```
print(BMI)
```



5) Factors -

Factors are the objects which are created using a vector. It stores the vector along with the distinct values of the elements in the vectors as labels. The labels are always characters irrespective of whether it is numeric or character or boolean, etc, in the input vector. They are useful in statistical modelling.

Factors are created using the factor() function. The nlevels function gives the count of levels.

Create a vector

```
apple.colors ← c('green', 'green', 'yellow')
```

Create a factor object

```
factor.apple ← factor(apple.colors)
```

```
print(factor.apple)
```

```
print(nlevels(factor.apple))
```

Vectors:

```
> x=c(1,2,3,4,5,6)
> x
[1] 1 2 3 4 5 6
> x=1:7
> x
[1] 1 2 3 4 5 6 7
```

Matrix:

```
A=matrix(nrow=2,ncol=3,data=c(9,2,1,7,5,4))
print(A)
B=t(A)
print(B)
print(A%*%B)
```

OUTPUT:

```
> source('G:/Practicals/R/EXP2/Second.R')
      [,1] [,2] [,3]
[1,]    9    1    5
[2,]    2    7    4
      [,1] [,2]
[1,]    9    2
[2,]    1    7
[3,]    5    4
      [,1] [,2]
[1,]   107   45
[2,]    45   69
```

List:

```
a=list(3,1,"Hello",4.1,TRUE,c(3,1,5),-3+4i)
print(a[[1]])
```

OUTPUT:

```
> source('G:/Practicals/R/EXP2/Second.R')
[1] 3
```

Data Frames:

```
fr=data.frame(1:3,c("Mahesh","Ganesh","Mangesh"),c(21,22,23))
colnames(fr)=c("Roll No.","Name","Age")
print(fr)
print(rownames(fr))
```

OUTPUT:

```
> source('G:/Practicals/R/EXP2/Second.R')
  Roll No.     Name Age
1          1 Mahesh  21
2          2 Ganesh  22
3          3 Mangesh 23
[1] "1" "2" "3"
```

Learning Outcomes Achieved:

1. We understood vectors, matrix and lists.
2. We understood *data frames* which are mainly required for data analysis in R.

Conclusion:

We have successfully demonstrated vectors, matrix, list and data frames in R.

13. Experiment/Assignment Evaluation

Experiment/Assignment Evaluation:		
Sr. No.	Parameters	Marks obtained
1	Technical Understanding (Assessment may be done based on Q & A <u>or</u> any other relevant method.) Teacher should mention the other method used -	6
2	Neatness/presentation	2
3	Punctuality	2
Date of performance (DOP)	17/01/2020	Total marks obtained
Date of checking (DOC)	26/03/2020	Signature of teacher

References:

1. URL: <https://cran.r-project.org/doc/manuals/r-release/R-intro.pdf> (Online Resources)
2. R Cookbook Paperback – 2011 by Teetor Paul O Reilly Publications
3. Beginning R: The Statistical Programming Language by Dr. Mark Gardener, Wiley Publications
4. R Programming For Dummies by Joris Meys Andrie de Vries, Wiley Publications

Viva Questions

1. What is vector in R ?
2. How to create matrix in R ?
3. What is difference between vector and list?
4. How is the data-frame different than matrix?
5. What is importance of data-frames in R?