R Data Types

1.Lists

Lists are generic vectors containing elements of different types - numbers,strings,vectors,other lists,matrices,functions.

To Create a List - list () function

```
n=list(3 ,2,  c(TRUE,TRUE), c(7,8,9))
n
```

1.1 Accessing Lists

Lists are accessed the same way as vectors. Integer, Logical and character vectors are used to access them.

Elements are accessed by index of the list.

Using the square bracket, we receive a single slice of the list

```
n = list(c(2,3,5),c('a','b'),c(TRUE,FALSE,TRUE),3)
n
n[2]
n[c(2:4)]
n[-2]
n[c(TRUE,FALSE,FALSE,FALSE)]
names (n) =c("First","Second","Third","Fourth")
n$Second
```

1.2 Update list elements

New elements can be added,deleted and updated. Addition and deletion can happen only at the end of the list. But updates can happen at any element.

```
n = list(c(2,3,5),c('a','b'),c(TRUE,FALSE,TRUE),3)
n[5]="New Element"
n[5]
n[5] = NULL
n[6]
n[3]=c("apple")
n
```

1.3 Merging the List

```
m = list (c(2,3,5))
n= list(c('a','b','c'))
merged_list=c(m,n)
merged_list
```

1.4 List to Vector Conversion

A list can be converted to a vector so that elements can be manipulated. After conversion, we can perform arithmetic operations on them.

```
l = list(1:5)
l
m = list(16:20)
m
a=unlist(l)
b=unlist(m)
c=a+b
c
```

2. Matrices

Matrices contain elements of the same type. We can create logical and character matrices too, but it is of no use.

CREATION OF MATRIX USING MATRIX() FUNCTION

Basic Syntax is

matrix(data,nrow=number_of_rows,ncol=number_of_columns,byrow,dimnames)

```
m=matrix(c(1:15),nrow=5,byrow=TRUE)
m
m=matrix(c(1:15),nrow=5,byrow=FALSE)
m
```

CREATION OF MATRIX USING RBIND() AND CBIND() Function

```
m=cbind(c(1,2,3),c(4,5,6))
m
n=rbind(c(1,2,3),c(4,5,6))
n
```

CONVERSION OF VECTOR TO MATRIX USING DIM() FUNCTION

```
m=c(1,2,3,4,5,6,7,8)
m
dim(m)=c(4,2)
m
```

3 WAYS IN ACCESSING MATRIX ELEMENTS

1. Integer Vector as index

```
m=matrix(c(1:15),nrow=5,byrow=TRUE)
m
m[2,3]
m[2,]
m[,3]
m[,]
m[,c(1,3)]
m[c(3,2),]
```

m[c(1,3),c(1,2)]

2. **Using Logical Vector as index**

m=matrix(c(1:15),nrow=5,byrow=TRUE)
m
m[c(TRUE,TRUE,FALSE,FALSE,FALSE),c(TRUE,FALSE,TRUE)]

3. ***Character Vector as Index***

m=matrix(c(1:12),nrow=3,byrow=TRUE,dimnames=list(c("r1","r2","r3"),c("c1","c2","c3","c4")))
m
m["r2","c3"]
m[,"c3"]