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CLASS : IT – B

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R LAB – 01

TASK – 1 :

Performing basic mathematical operations and Different Datatypes in R studio..

PROGRAM :

```
1+1
1+2+3+4+5
2*4*5
12*5
4/2
2/4
4*6+5
(4*6)+5
4*(6+5)


a=2
a
b<-10
b
30->c
c
e<-f<-20
e
```

```
f
assign("z",50)
z
rm(z)
theVariable <- 17
theVariable
THEVARIABLE

class(a)
is.numeric(b)
i <- 9L
i
is.numeric(i)
is.integer(i)

class(4L)
class(2.8)
s = 4L*2.8
class(s)
class(5L)
s1 = 5L/2L
class(s1)

x1 <- "data set"
x1
nchar(x1)
nchar("welcome")
nchar(5)
```

```
nchar(1234)

date1 <- as.Date("2022-03-31")
date1
class(date1)
as.numeric(date1)

date2 <- as.POSIXct("2022-03-31 17:42")
class(date2)
date2
as.numeric(date2)
class(as.numeric(date1))

TRUE*5
FALSE*10
k <- TRUE
k
class(k)
is.logical(k)

T
class(T)
T = 10
T
class(T)

99 == 91
5!=8
```

```
9 < 10
9 <= 9

# what is a variable
"data" == "stats"
"data" < "stats"
"data" == "hell"
plot(a,b)
```

Output :

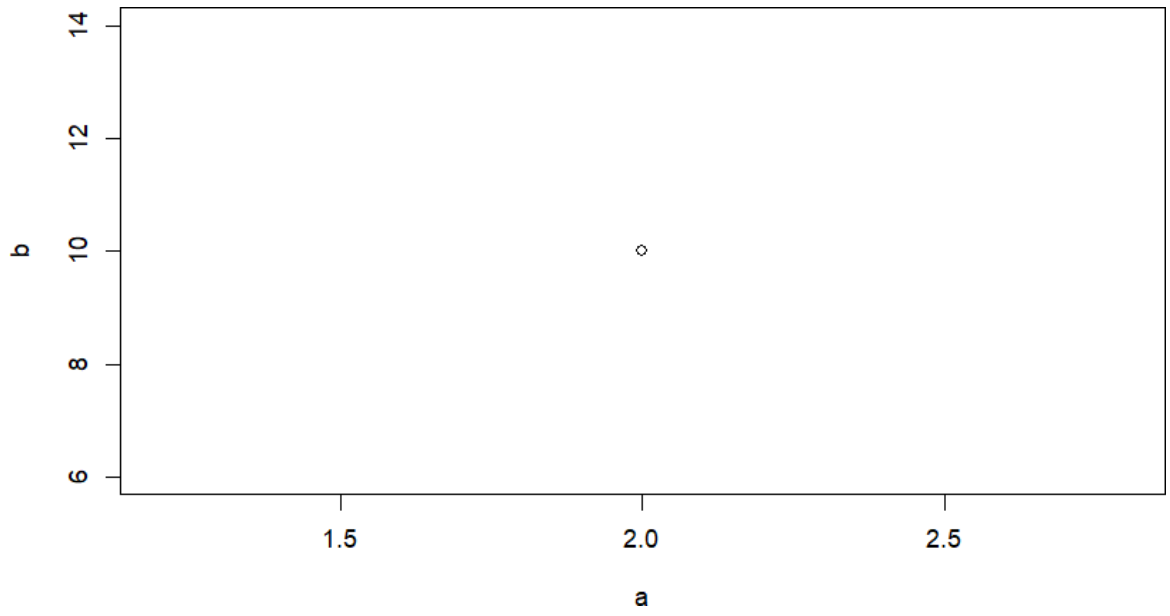
```
> 1+1
[1] 2
> 1+2+3+4+5
[1] 15
> 2*4*5
[1] 40
> 12*5
[1] 60
> 4/2
[1] 2
> 2/4
[1] 0.5
> 4*6+5
[1] 29
> (4*6)+5
[1] 29
> 4*(6+5)
[1] 44
```

```
> a=2
> a
[1] 2
> b<-10
> b
[1] 10
> 30->c
> c
[1] 30
> e<-f<-20
> e
[1] 20
> f
[1] 20
> assign("z",50)
> z
[1] 50
> rm(z)
> theVariable <- 17
> theVariable
[1] 17
> THEVARIABLE
Error: object 'THEVARIABLE' not found
> class(a)
[1] "numeric"
> is.numeric(b)
[1] TRUE
> i <- 9L
```

```
> i
[1] 9
> is.numeric(i)
[1] TRUE
> is.integer(i)
[1] TRUE
> class(4L)
[1] "integer"
> class(2.8)
[1] "numeric"
> s = 4L*2.8
> class(s)
[1] "numeric"
> class(5L)
[1] "integer"
> s1 = 5L/2L
> class(s1)
[1] "numeric"
> x1 <- "data set"
> x1
[1] "data set"
> nchar(x1)
[1] 8
> nchar("welcome")
[1] 7
> nchar(5)
[1] 1
> nchar(1234)
```

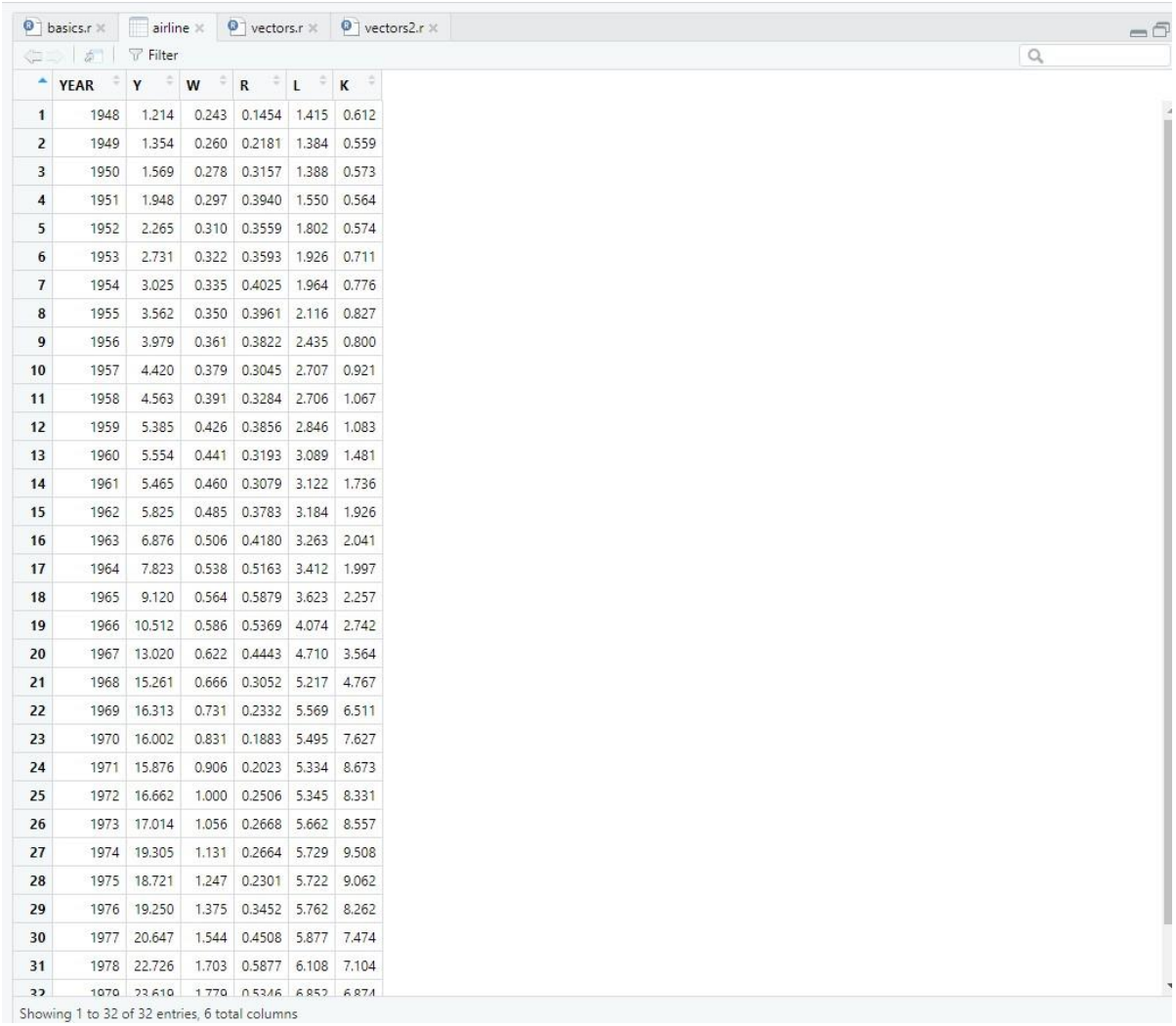
```
[1] 4
> date1 <- as.Date("2022-03-31")
> date1
[1] "2022-03-31"
> class(date1)
[1] "Date"
> as.numeric(date1)
[1] 19082
> date2 <- as.POSIXct("2022-03-31 17:42")
> class(date2)
[1] "POSIXct" "POSIXt"
> date2
[1] "2022-03-31 17:42:00 IST"
> as.numeric(date2)
[1] 1648728720
> class(as.numeric(date1))
[1] "numeric"
> TRUE*5
[1] 5
> FALSE*10
[1] 0
> k <- TRUE
> k
[1] TRUE
> class(k)
[1] "logical"
> is.logical(k)
[1] TRUE
```

```
> T
[1] TRUE
> class(T)
[1] "logical"
> T = 10
> T
[1] 10
> class(T)
[1] "numeric"
> 99 == 91
[1] FALSE
> 5!=8
[1] TRUE
> 9 < 10
[1] TRUE
> 9 <= 9
[1] TRUE
> # what is a variable
> "data" == "stats"
[1] FALSE
> "data" < "stats"
[1] TRUE
> "data" == "hell"
[1] FALSE
> plot(a,b)
```



TASK – 02 :

Importing Random Excel Dataset From Internet



basics.r | airline | vectors.r | vectors2.r

Filter

	YEAR	Y	W	R	L	K
1	1948	1.214	0.243	0.1454	1.415	0.612
2	1949	1.354	0.260	0.2181	1.384	0.559
3	1950	1.569	0.278	0.3157	1.388	0.573
4	1951	1.948	0.297	0.3940	1.550	0.564
5	1952	2.265	0.310	0.3559	1.802	0.574
6	1953	2.731	0.322	0.3593	1.926	0.711
7	1954	3.025	0.335	0.4025	1.964	0.776
8	1955	3.562	0.350	0.3961	2.116	0.827
9	1956	3.979	0.361	0.3822	2.435	0.800
10	1957	4.420	0.379	0.3045	2.707	0.921
11	1958	4.563	0.391	0.3284	2.706	1.067
12	1959	5.385	0.426	0.3856	2.846	1.083
13	1960	5.554	0.441	0.3193	3.089	1.481
14	1961	5.465	0.460	0.3079	3.122	1.736
15	1962	5.825	0.485	0.3783	3.184	1.926
16	1963	6.876	0.506	0.4180	3.263	2.041
17	1964	7.823	0.538	0.5163	3.412	1.997
18	1965	9.120	0.564	0.5879	3.623	2.257
19	1966	10.512	0.586	0.5369	4.074	2.742
20	1967	13.020	0.622	0.4443	4.710	3.564
21	1968	15.261	0.666	0.3052	5.217	4.767
22	1969	16.313	0.731	0.2332	5.569	6.511
23	1970	16.002	0.831	0.1883	5.495	7.627
24	1971	15.876	0.906	0.2023	5.334	8.673
25	1972	16.662	1.000	0.2506	5.345	8.331
26	1973	17.014	1.056	0.2668	5.662	8.557
27	1974	19.305	1.131	0.2664	5.729	9.508
28	1975	18.721	1.247	0.2301	5.722	9.062
29	1976	19.250	1.375	0.3452	5.762	8.262
30	1977	20.647	1.544	0.4508	5.877	7.474
31	1978	22.726	1.703	0.5877	6.108	7.104
32	1979	23.619	1.779	0.5346	6.852	6.874

Showing 1 to 32 of 32 entries, 6 total columns

R LAB – 02

TASK – 01 :

Applying Different Operations Vectors

Program :

```
x <- c(1,2,3,4,5,6,7,8,9,10)
x


x + 2
x - 5
x * 5
```

```
x / 2
x ^ 2
sqrt(x)
class(x)

1:10
10:1
-2:5
5:-2
a = 1:10
b = -5:4
a
b

a + b
a - b
a * b
a / b
a ^ b

length(a)
length(b)
length(a + b)

z = a + b * x / 2
z

a + c(1,2)
a + c(1,2,3)

a <= 5
```

```
a < b


a1 = 10:1
b1 = -4:5


any(a1 < b1)
all(a1 < b1)


q =
c("Hockey","Football","Baseball","Curling","Rugby","Lacrosse","Basketball","Tennis","
Cricket","Soccer")
q


nchar(q)
length(q)


a1[1]
a1[1:3]
a1[c(1,4)]



d1 = c(One = "x", Two = "Y", Three = "Z")
d1


w = 1:3
w
names(w) = c("col1","col2","col3")
w


q2 = c(q,"Hockey","Lacrosse","Hockey","Waterpolo","Hockey","Lacrosee")
q2fact = as.factor(q2)
q2fact
```

```
as.numeric((q2fact))


abs(-356)
ceiling(3.56)
floor(3.56)
round(3.56)
```

Output :

```
> x <- c(1,2,3,4,5,6,7,8,9,10)
> x
 [1]  1  2  3  4  5  6  7  8  9 10
> x + 2
 [1]  3  4  5  6  7  8  9 10 11 12
> x - 5
 [1] -4 -3 -2 -1  0 1  2  3  4  5
> x * 5
 [1]  5 10 15 20 25 30 35 40 45 50
> x / 2
 [1] 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0
> x ^ 2
 [1]  1   4   9  16  25  36  49  64  81 100
> sqrt(x)
 [1] 1.000000 1.414214 1.732051 2.000000 2.236068 2.449490 2.645751 2.828427
3.000000 3.162278
> class(x)
[1] "numeric"
> 1:10
 [1]  1  2  3  4  5  6  7  8  9 10
> 10:1
 [1] 10 9  8  7  6  5  4  3  2  1
> -2:5
```

```
[1] -2 -1 0  1  2  3  4  5
> 5:-2
[1]  5 4  3  2  1  0 -1 -2
> a = 1:10
> b = -5:4
> a
 [1]  1  2  3  4  5  6  7  8  9 10
> b
 [1] -5 -4 -3 -2 -1  0  1  2  3  4
> a + b
 [1] -4 -2  0  2  4  6  8 10 12 14
> a - b
 [1] 6 6 6 6 6 6 6 6 6 6
> a * b
 [1] -5 -8 -9 -8 -5  0  7 16 27 40
> a / b
 [1] -0.2 -0.5 -1.0 -2.0 -5.0  Inf  7.0  4.0  3.0  2.5
> a ^ b
 [1] 1.000000e+00 6.250000e-02 3.703704e-02 6.250000e-02 2.000000e-01
1.000000e+00 7.000000e+00 6.400000e+01
 [9] 7.290000e+02 1.000000e+04
> length(a)
[1] 10
> length(b)
[1] 10
> length(a + b)
[1] 10
> z = a + b * x / 2
> z
 [1] -1.5 -2.0 -1.5  0.0  2.5  6.0 10.5 16.0 22.5 30.0
> a + c(1,2)
 [1]  2  4  4  6  6  8  8 10 10 12
```

```
> a + c(1,2,3)
 [1]  2  4  6  5  7  9  8 10 12 11
Warning message:
In a + c(1, 2, 3) :
  longer object length is not a multiple of shorter object length
> a <= 5
 [1]  TRUE  TRUE  TRUE  TRUE  TRUE FALSE FALSE FALSE FALSE FALSE
> a < b
 [1] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
> a1 = 10:1
> b1 = -4:5
> any(a1 < b1)
[1] TRUE
> all(a1 < b1)
[1] FALSE
> q =
c("Hockey","Football","Baseball","Curling","Rugby","Lacrosse","Basketball","Tennis","
Cricket","Soccer")
> q
 [1] "Hockey"     "Football"   "Baseball"   "Curling"    "Rugby"      "Lacrosse"
"Basketball" "Tennis"
 [9] "Cricket"    "Soccer"
> nchar(q)
 [1]  6  8  8  7  5  8 10  6  7  6
> length(q)
[1] 10
> a1[1]
[1] 10
> a1[1:3]
[1] 10  9  8
> a1[c(1,4)]
[1] 10  7
```

```
> d1 = c(One = "x", Two = "Y", Three = "Z")
> d1
  One Two Three
  "x"   "Y"   "Z"
> w = 1:3
> w
[1] 1 2 3
> names(w) = c("col1","col2","col3")
> w
col1 col2 col3
   1    2    3
> q2 = c(q,"Hockey","Lacrosse","Hockey","Waterpolo","Hockey","Lacrosee")
> q2fact = as.factor(q2)
> q2fact
 [1] Hockey    Football  Baseball  Curling   Rugby     Lacrosse Basketball Tennis
Cricket
[10] Soccer    Hockey    Lacrosse  Hockey    Waterpolo Hockey    Lacrosee
12 Levels: Baseball Basketball Cricket Curling Football Hockey Lacrosee Lacrosse
Rugby Soccer ... Waterpolo
> as.numeric((q2fact))
 [1]  6  5  1  4  9  8  2 11  3 10  6  8  6 12  6  7
> abs(-356)
[1] 356
> ceiling(3.56)
[1] 4
> floor(3.56)
[1] 3
> round(3.56)
[1] 4
```

R LAB – 03

Task – 01 :

Aim : Apply different operations on Vectors.

1. Write R code to create a vector of a specified type and length. Create vector of numeric, complex, logical and character types of length 6.

Program :

```
numbers = c(1,2,3,4,5,6)

numbers

class(numbers)

alpha = c('A','B','C','D','E','F')

alpha

class(alpha)

comp = c(1+2i,3+4i,5+6i,7+8i,9+3i,5+3i)

comp
```

```
class(comp)
logar = c(TRUE,FALSE,TRUE,FALSE,TRUE,FALSE)
logar
class(logar)
```

Output :

```
> numbers = c(1,2,3,4,5,6)
> numbers
[1] 1 2 3 4 5 6
> class(numbers)
[1] "numeric"
> alpha = c('A','B','C','D','E','F')
> alpha
[1] "A" "B" "C" "D" "E" "F"
> class(alpha)
[1] "character"
> comp = c(1+2i,3+4i,5+6i,7+8i,9+3i,5+3i)
> comp
[1] 1+2i 3+4i 5+6i 7+8i 9+3i 5+3i
> class(comp)
[1] "complex"
> logar =
c(TRUE,FALSE,TRUE,FALSE,TRUE,FALSE)
> logar
[1]  TRUE FALSE  TRUE FALSE  TRUE FALSE
```

```
> class(logar)
[1] "logical"
```

2. Write R code to add two vectors of integer's type and length 3

Program :

```
vect1 = c(1,2,3)
vect1
vect2 = c(4,5,6)
vect2
sum = vect1 + vect2
sum
```

Output :

```
> vect1 = c(1,2,3)
> vect1
[1] 1 2 3
> vect2 = c(4,5,6)
> vect2
[1] 4 5 6
> sum = vect1 + vect2
> sum
[1] 5 7 9
```

3. Write R code to append value to a given empty vector

Program :

```
x = c()
k = append(x,1:5)
k
```

Output :

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

4. Write R code to multiply two vectors of integer's type and length 3.

Program :

```
mul1 = c(1,2,3)
mul2 = c(6,7,8)
mul3 = mul1*mul2
mul3
```

Output :

```
> mul1 = c(1,2,3)
> mul2 = c(6,7,8)
> mul3 = mul1*mul2
> mul3
[1]  6 14 24
```

5. Write R code to divide two vectors of integer's type and length 3.

Program :

```
div1 = c(4,6,8)
div2 = c(2,2,2)
div3 = div1 /div2
div3
```

Output :

```
> div1 = c(4,6,8)
> div2 = c(2,2,2)
> div3 = div1 /div2
> div3
[1] 2 3 4
```

6. Write R code to find Sum, Mean and Product of a Vector

Program :

```
vect = c(1,2,3,4,5)
vect
addv = sum(vect)
addv
avg = mean(vect)
avg
mul = prod(vect)
mul
```

Output :

```
> vect = c(1,2,3,4,5)
> vect
```

[1] 1 2 3 4 5

> addv = sum(vect)

> addv

[1] 15

> avg = mean(vect)

> avg

[1] 3

> mul = prod(vect)

> mul

[1] 120

7. Write R code to find Sum, Mean and Product of a Vector, ignore element like NA or NaN.

Prorgam :

```
temp = c(1,NA,5,NA,2,3)
vadd = sum(temp,na.rm = TRUE)
vmean = mean(temp,na.rm = TRUE)
vmul = prod(temp,na.rm = TRUE)
vadd
vmean
vmul
```

Output :

```
> temp = c(1,NA,5,NA,2,3)
> vadd = sum(temp,na.rm = TRUE)
> vmean = mean(temp,na.rm = TRUE)
```

> vmul = prod(temp,na.rm = TRUE)

> vadd

[1] 11

> vmean

[1] 2.75

> vmul

[1] 30

8. Write R code to find the minimum and the maximum of a Vector.

Program :

```
large = c(2,4,64,56,43,1)

small = min(large)

big = max(large)

small

big
```

Output :

> large = c(2,4,64,56,43,1)

> small = min(large)

> big = max(large)

> small

[1] 1

> big

[1] 64

9. Write R code to sort a Vector in ascending and descending order.

Program :

```
unsort = c(45,1,67,23,98,43,66)

ascen = sort(unsort,decreasing = FALSE)

desen = sort(unsort, decreasing = TRUE)

ascen

desen
```

Output :

```
> unsort = c(45,1,67,23,98,43,66)

> ascen = sort(unsort,decreasing = FALSE)

> desen = sort(unsort, decreasing = TRUE)

> ascen

[1]  1 23 43 45 66 67 98

> desen

[1] 98 67 66 45 43 23  1
```

10. Write R code to test whether a given vector contains a specified element.

Program :

```
lins = c(2,4,5,6,7)

res = match(4,lins)

res
```

Output :

```
> lins = c(2,4,5,6,7)
```

> res = match(4,lins)

> res

[1] 2

11.Write R code to count the specific value in a given vector..

Program :

```
rep = c(1,2,2,2,3,4,1)
result = sum(rep == 2)
result
```

Output :

```
> rep = c(1,2,2,2,3,4,1)
> result = sum(rep == 2)
> result
[1] 3
```

12.Write R code to access the last value in a given vector.

Program :

```
org = c(1,2,3,4,5)
orgres = tail(org,n = 1)
orgres
```

Output :

```
> org = c(1,2,3,4,5)
> orgres = tail(org,n = 1)
> orgres
```

[1] 5

1. Write R code to find second highest value in a given vector.

Program :

```
sh = c(15,3,10,1,7,9)
sh
sh2 = sort(sh,decreasing = TRUE)
sh3 = sh2[2]
sh3
```

Output :

```
> sh = c(15,3,10,1,7,9)
> sh
[1] 15  3 10  1  7  9
> sh2 = sort(sh,decreasing = TRUE)
> sh3 = sh2[2]
> sh3
[1] 10
```

2. Write R code to find nth highest value in a given vector.

Program :

```
n1 = c(15,3,10,1,7,9)
n2 = readline()
n3 = sort(n1,decreasing = TRUE)
n4 = n3[n2]
n4
```

Output :

```
> n1 = c(15,3,10,1,7,9)
> n2 = readline()
80
n3 = sort(n1,decreasing = TRUE)
> n4 = n3[n2]
> n4
[1] NA
```

3. Write R code to find common elements from multiple vector.

Program :

```
cv = c(2,1,3,4,5)
cv2 = c(2,6,7,1,9)
cv3 = c(3,7,8,2,10)
cv4 = intersect(intersect(cv,cv2),cv3)
cv4
```

Output :

```
> cv = c(2,1,3,4,5)
> cv2 = c(2,6,7,1,9)
> cv3 = c(3,7,8,2,10)
> cv4 = intersect(intersect(cv,cv2),cv3)
> cv4
[1] 2
```

4. Write R code to convert given dataframe column(s) to a vector.

Program :

```
df1 = c(1,2,3,4,5)
df2 = c(6,7,8,9,10)
df3 = c(11,12,13,14,15)
df4 = c(16,17,18,19,20)
df <- data.frame(df1 = 1:5, df2 = 6:10, df3 = 11:15, df4 = 16:20)
df
```

Output :

```
> df1 = c(1,2,3,4,5)
> df2 = c(6,7,8,9,10)
> df3 = c(11,12,13,14,15)
> df4 = c(16,17,18,19,20)
> df <- data.frame(df1 = 1:5, df2 = 6:10, df3 = 11:15, df4 = 16:20)
> df
  df1 df2 df3 df4
1   1   6  11  16
2   2   7  12  17
3   3   8  13  18
4   4   9  14  19
5   5  10  15  20
```

5. Write R code to extract every nth element of a given vector.

Program :

```
gv = 1:30
gv1 = gv[seq(1, length(gv), 5)]
gv1
```

Output :

```
> gv = 1:30
> gv1 = gv[seq(1, length(gv), 5)]
> gv1
[1]  1  6 11 16 21 26
```

6. Write R code to list the distinct values in a vector from a given vector.

Program :

```
repv <- c(10,10,10,20,20,30,40,50,89,89)
repv1 <- unique(repv)
repv1
```

Output :

```
> repv <- c(10,10,10,20,20,30,40,50,89,89)
> repv1 <- unique(repv)
> repv1
[1] 10 20 30 40 50 89
```

7. Write R code to find the elements of a given vector that are not in another given vector.

Program :

```
de = c(1,2,3,3,3,4)
```

```
de1 = c(5,6,6,6,8)
de2 = setdiff(de,de1)
de2
```

Output :

```
> de = c(1,2,3,3,3,4)
> de1 = c(5,6,6,6,8)
> de2 = setdiff(de,de1)
> de2
[1] 1 2 3 4
```

8. Write R code to reverse the order of given vector.

Program :

```
v1 = c(1,2,3,4,5)
v2 = rev(v1)
v2
```

Output :

```
> v1 = c(1,2,3,4,5)
> v2 = rev(v1)
> v2
[1] 5 4 3 2 1
```

9. Write R code to concatenate a vector.

Program :

```
vcon1 = c(1,2,3)
vcon2 = c(4,5,6)
```

```
vcon3 = c(vcon1,vcon2)
vcon3
```

Output :

```
> vcon1 = c(1,2,3)
> vcon2 = c(4,5,6)
> vcon3 = c(vcon1,vcon2)
> vcon3
[1] 1 2 3 4 5 6
```

10. Write R code to count number of values in a range in a given vector.

Program :

```
r1 = c(0,1,2,3,4,5,6,7,8,9,10)
r2 = sum(r1 > 2 & r1 < 9)
r2
```

Output :

```
> r1 = c(0,1,2,3,4,5,6,7,8,9,10)
> r2 = sum(r1 > 2 & r1 < 9)
> r2
[1] 6
```

11. Write R code to convert two columns of a data frame to a named

vector.

Program :

```
plang = c(' c language ',' python ',' c++ ',' HTMl ','
      java ')
ide = c('Turboc++', 'pycharm', 'online', 'notepad',
      'netbeans')
tab = data.frame(languages = plang, IDE = ide)
tab
setNames(as.character(tab$languages),
      as.character(tab$IDE))
```

Output :

```
> plang = c(' c language ',' python ',' c++ ',' HTMl ','
      java ')
> ide = c('Turboc++', 'pycharm', 'online', 'notepad',
      'netbeans')
> tab = data.frame(languages = plang, IDE = ide)
> tab
    languages      IDE
1  c language  Turboc++
2      python   pycharm
3         c++    online
4        HTMl   notepad
5        java  netbeans
> setNames(as.character(tab$languages),
      as.character(tab$IDE))
     Turboc++       pycharm        online       notepad
      netbeans
```

" c language " " python " " c++ " " HTMl "
" java "

12. Write R code to create a vector and find the length and the dimension of the vector.

Program :

```
real = c(1,2,3,4,5,6)
length(real)
dim(real)
```

Output :

```
> real = c(1,2,3,4,5,6)
> length(real)
[1] 6
> dim(real)
NULL
```

13. Write R code to test whether the value of the element of a given vector greater than 10 or not. Return TRUE or FALSE.

Program :

```
whole = c(0,1,2,3,25,15,99,100)
whole > 10
```

Output :

```
> whole = c(0,1,2,3,25,15,99,100)
> whole > 10
[1] FALSE FALSE FALSE FALSE TRUE
TRUE TRUE TRUE
```

14.Write R code to add 3 to each element in a given vector. Print the original and new vector.

Program :

```
ov = c(1,2,3,4)
nv = ov + 3
ov
nv
```

Output :

```
> ov = c(1,2,3,4)
> nv = ov + 3
> ov
[1] 1 2 3 4
> nv
[1] 4 5 6 7
```

15.Write a R code to create a vector using: operator and seq() function.

Program :

```
sap = seq(from = 1, to = 30)
sap
```

Output :

```
> sap  =  seq(from = 1, to = 30)
> sap
 [1]  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 17
18 19 20 21 22 23 24 25 26 27 28 29 30
```

Result : Successfully completed the Vectors task.

R LAB -- 04

Task – 01 :

Aim : Create a data frame that stores the name, age, designation of the

employee. Find how many employees are working in each designation?

Program :

```
name = c(' Mounav ', ' Rizwan ', ' Ajay ', ' Charan ', ' Vamsi ', ' M.sai ')

age  = c(19, 19, 20, 30, 18, 20)

desig = c(' Manager ', ' webprogramer ', ' cyber-manager ', ' Manager ', ' webprogramer ', ' Boss ')
```

```
df = data.frame(Employee = name, Age = age, Designation = desig)
df
ind = unique(desig)

des = c()
no = c()

for(i in 1 : length(ind))
{
  count = 0
  for(j in 1 : length(desig))
  {
    if(ind[i] == desig[j])
    {
      count = count + 1
    }
  }
  des = append(des,ind[i])
  no = append(no,count)
}
des
no

result = data.frame("Designation" = ind, "Count" = no)
result
```

Output :

```
 > name = c(' Mounav ', ' Rizwan ', ' Ajay ', ' Charan ', ' Vamsi ', ' M.sai ')
> age  = c(19, 19, 20, 30, 18, 20)
> desig = c(' Manager ', ' webprogramer ', ' cyber-manager ', ' Manager ', ' webprogramer ', ' Boss ')
> df = data.frame(Employee = name, Age = age, Designation = desig)
> df
  Employee Age     Designation
1  Mounav   19        Manager
2  Rizwan   19   webprogramer
3    Ajay   20  cyber-manager
4  Charan   30        Manager
5   Vamsi   18   webprogramer
6   M.sai   20           Boss
> ind = unique(desig)
> des = c()
> no = c()
> for(i in 1 : length(ind))
+ {
+   count = 0
+   for(j in 1 : length(desig))
+   {
+     if(ind[i] == desig[j])
+     {
+       count = count + 1
```

```
+    }
+  }
+  des = append(des,ind[i])
+  no = append(no,count)
+ }
> des
[1] " Manager "       " webprogramer " " cyber-manager " " Boss
"
> no
[1] 2 2 1 1
> result = data.frame("Designation" = ind, "Count" = no)
> result
     Designation             Count
1        Manager        2
2   webprogramer       2
3  cyber-manager        1
4           Boss                 1
```

Aim : Create two vectors that stores the details of name and gender of the employees. Find how many ‘male’ and ‘female’ employees are present?

Program :

```
name1  <-  c('sai','geetha','ajay','Madhu','vamsi','Parveen')
gender <- c('male','female','male','female','male','female')
mc = sum(gender == 'male')
fc = sum(gender == 'female')
print("No.of male employess : ")
```

```
mc
print("No.of female employess : ")
fc
```

Output :

```
> name1  <-  c('sai','geetha','ajay','Madhu','vamsi','Parveen')
> gender  <- c('male','female','male','female','male','female')
> mc = sum(gender == 'male')
> fc = sum(gender == 'female')
> print("No.of male employess : ")
[1] "No.of male employess : "
> mc
[1] 3
> print("No.of female employess : ")
[1] "No.of female employess : "
> fc
[1] 3
```

Result : Successfully completed the Both Aims.

R LAB – 05

Task – 01 :

Aim : Apply Different operations On Matrices in R.

1. Write a R program to create a matrix taking a given vector of numbers as input. Display the matrix

   Program :

   num = c(1,2,3,4,5,6,7,8,9,10)

```
ans = matrix(num, nrow = 5)
ans
```

Output :

```
> num = c(1,2,3,4,5,6,7,8,9,10)
> ans = matrix(num, nrow = 5)
> ans
     [,1] [,2]
[1,]    1    6
[2,]    2    7
[3,]    3    8
[4,]    4    9
[5,]    5   10
```

2. Write a R program to create a matrix taking a given vector of numbers as input and define the column and row names. Display the matrix

Program :

```
vect = c(1,2,3,4,5,6,7,8,9)
ans2 = matrix(vect, nrow = 3)
ans2
rownames(ans2)
colnames(ans2)
rownames(ans2) = c("First","Second","Third")
colnames(ans2) = c("col1","col2","col3")
rownames(ans2)
colnames(ans2)
ans2
```

Output :

```
> vect = c(1,2,3,4,5,6,7,8,9)
> ans2 = matrix(vect, nrow = 3)
> ans2
     [,1] [,2] [,3]
[1,]    1    4    7
[2,]    2    5    8
[3,]    3    6    9
> rownames(ans2)
```

```
NULL
> colnames(ans2)
NULL
> rownames(ans2) = c("First","Second","Third")
> colnames(ans2) = c("col1","col2","col3")
> rownames(ans2)
[1] "First"  "Second" "Third"
> colnames(ans2)
[1] "col1" "col2" "col3"
> ans2
       col1 col2 col3
First     1    4    7
Second    2    5    8
Third     3    6    9
```

3. Write a R program to access the element at 3rd column and 2nd row, only the 3rd row and only the 4th column of a given matrix

Program :

```
vect3 = c(9,8,7,6,5,4,3,2,1)
ans3 = matrix(vect3, nrow = 3)
ans3
res = ans3[c(2),c(3)]
res
```

Output :

```
> vect3 = c(9,8,7,6,5,4,3,2,1)
> ans3 = matrix(vect3, nrow = 3)
> ans3
     [,1] [,2] [,3]
[1,]    9    6    3
[2,]    8    5    2
[3,]    7    4    1
> res = ans3[c(2),c(3)]
> res
[1] 2
```

4. Write a R program to create two 2x3 matrix and add, subtract, multiply and divide the matrixes.

Program :

```
arth = matrix(c(1,2,3,4,5,6), nrow = 2, ncol = 3)
arth
arth2 = matrix(c(7,8,9,10,11,12), nrow = 2, ncol = 3)
arth2
arth3 = t(arth2)
arth3
add = arth + arth2
add
sub = arth - arth2
sub
mul = arth * arth2
mul
div = arth / arth2
div
```

Output :

```
> arth = matrix(c(1,2,3,4,5,6), nrow = 2, ncol = 3)
> arth
     [,1] [,2] [,3]
[1,]    1    3    5
[2,]    2    4    6
> arth2 = matrix(c(7,8,9,10,11,12), nrow = 2, ncol = 3)
> arth2
     [,1] [,2] [,3]
[1,]    7    9   11
[2,]    8   10   12
> arth3 = t(arth2)
> arth3
     [,1] [,2]
[1,]    7    8
[2,]    9   10
[3,]   11   12
> add = arth + arth2
> add
```

```
     [,1] [,2] [,3]
[1,]    8   12   16
[2,]   10   14   18
> sub = arth - arth2
> sub
     [,1] [,2] [,3]
[1,]   -6   -6   -6
[2,]   -6   -6   -6
> mul = arth * arth2
> mul
     [,1] [,2] [,3]
[1,]    7   27   55
[2,]   16   40   72
> div = arth / arth2
> div
          [,1]      [,2]      [,3]
[1,] 0.1428571 0.3333333 0.4545455
[2,] 0.2500000 0.4000000 0.5000000
```

5. Write a R program to extract the submatrix whose rows have column value > 7 from a given matrix

Program :

```
rname = c("r1","r2","r3","r4")
cname = c("c1","c2","c3","c4")
vect5 = matrix(1:16, nrow = 4, byrow = TRUE, dimnames
= list(rname,cname))
vect5
vect5[vect5[,3] > 7,]
```

Output :

```
> rname = c("r1","r2","r3","r4")
> cname = c("c1","c2","c3","c4")
> vect5 = matrix(1:16, nrow = 4, byrow = TRUE,
dimnames = list(rname,cname))
> vect5
   c1 c2 c3 c4
r1 1 2 3  4
```

```
r2  5 6  7  8
r3  9 10 11 12
r4 13 14 15 16
>
> vect5[vect5[,3] > 7,]
   c1 c2 c3 c4
r3  9 10 11 12
r4 13 14 15 16
```

6. Write a R program to convert a given matrix to a list of column-vectors

Program :

```
x = matrix(1:12, ncol=3)
x
l =  split(x, rep(1:ncol(x), each = nrow(x)))
l
```

Output :

```
> x = matrix(1:12, ncol=3)
> x
     [,1] [,2] [,3]
[1,]    1    5    9
[2,]    2    6   10
[3,]    3    7   11
[4,]    4    8   12
> l =  split(x, rep(1:ncol(x), each = nrow(x)))
> l
$`1`
[1] 1 2 3 4
$`2`
[1] 5 6 7 8
$`3`
[1]  9 10 11 12
```

7. Write a R program to find row and column index of maximum and minimum value in a given matrix

Program :

```
mat7 = matrix(1:20, nrow = 4)
mat7
a = max(mat7)
b = min(mat7)
which(mat7 == a,arr.ind = TRUE)
which(mat7 == b, arr.ind = TRUE)
```

Output :

```
> mat7 = matrix(1:20, nrow = 4)
> mat7
     [,1] [,2] [,3] [,4] [,5]
[1,]    1    5    9   13   17
[2,]    2    6   10   14   18
[3,]    3    7   11   15   19
[4,]    4    8   12   16   20
> a = max(mat7)
> b = min(mat7)
> which(mat7 == a,arr.ind = TRUE)
     row col
[1,]   4   5
> which(mat7 == b, arr.ind = TRUE)
     row col
[1,]   1   1
```

Task – 02 :

Aim : Access the Databases and Tables from mysql to R

Program :

```
install.packages("RMySQL")

library(RMySQL)

mydb = dbConnect(MySQL(), user='root', password='',
dbname='student', host='localhost')

mydb
```

```
dbListTables(mydb)

dbListFields(mydb, 'ddl_student')

rs = dbSendQuery(mydb, "select * from ddl_student")

rs

data = fetch(rs, n=-1)

data
```

Output :

```
> mydb = dbConnect(MySQL(), user='root', password='',
dbname='student', host='localhost')

> mydb

<MySQLConnection:0,0>

> dbListTables(mydb)

[1] "ddl_student"       "dml_student"       "sample"
"student_data_type" "student_info"

> dbListFields(mydb, 'ddl_student')

[1] "S_no"    "section" "Roll_no" "maths"   "python" "college"
"dept"

> rs = dbSendQuery(mydb, "select * from ddl_student")

> rs

<MySQLResult:2,0,2>

> data = fetch(rs, n=-1)

> data

  S_no section    Roll_no  maths python college dept

1   NA    <NA> 208w1a12a0  98.50    99.0   vrsec <NA>

2   NA    <NA> 208w1a1299  92.40    96.0   vrsec <NA>

3   NA    <NA> 208w1a1291 100.98    99.9   vrsec <NA>
```

Task – 03 :

Aim : Load the CSV file into R and manipulate data inside csv.

Program :

```
getwd()
setwd("E:/venkat sai/rstudio_language") # it will set the new directory location
getwd() # it will return the present location of working directory.
cdata <- read.csv("company.csv")
cdata
# Analyzing the CSV file
is.data.frame(cdata)
ncol(cdata)
nrow(cdata)
# getting the maximum salary from the csv file
sal <- max(cdata$salary)
sal
# getting the person details from the max salary
psal <- subset(cdata, salary == max(salary))
psal
temp = subset(cdata, dept == "IT")
temp
# Employess less than 600 in IT department
lesit = subset(cdata, salary < 600 & dept == "IT")
lesit
# Employess joined After 2014 Year
```

```
afyear = subset(cdata, as.Date(start_date) > as.Date("2014-01-01"))

afyear

# Writing into CSV file

write.csv(afyear,"output.csv")

read.csv("output.csv")
```

Output :

```
> getwd()

[1] "C:/Users/SHREEE/OneDrive/Documents"

> setwd("E:/venkat sai/rstudio_language") # it will set the new directory location

>

> getwd() # it will return the present location of working directory.

[1] "E:/venkat sai/rstudio_language"

> cdata <- read.csv("company.csv")

> cdata

  id     name salary start_date       dept

1  1     Rick 623.30 2012-01-01         IT

2  2      Dan 515.20 2013-09-23 Operations

3  3 Michelle 611.00 2014-11-15         IT

4 4       Ryan 729.00 2014-05-11         HR

5 5       Gary 843.25 2015-03-27    Finance

6 6       Nina 578.00 2013-05-21         IT

7  7    Simon 632.80 2013-07-30 Operations

8  8     Guru 722.50 2014-06-17    Finance

> # Analyzing the CSV file
```

```
> is.data.frame(cdata)
[1] TRUE
> ncol(cdata)
[1] 5
> nrow(cdata)
[1] 8
> # getting the maximum salary from the csv file
> sal <- max(cdata$salary)
> sal
[1] 843.25
> # getting the person details from the max salary
> psal <- subset(cdata, salary == max(salary))
> psal
  id name salary start_date    dept
5  5 Gary 843.25 2015-03-27 Finance
> temp = subset(cdata, dept == "IT")
> temp
  id     name salary start_date dept
1  1     Rick  623.3 2012-01-01   IT
3  3 Michelle  611.0 2014-11-15   IT
6  6     Nina  578.0 2013-05-21   IT
> # Employess less than 600 in IT department
> lesit = subset(cdata, salary < 600 & dept == "IT")
> lesit
  id name salary start_date dept
6  6 Nina    578 2013-05-21   IT
```

```
> # Employess joined After 2014 Year
> afyear = subset(cdata, as.Date(start_date) > as.Date("2014-01-01"))
> afyear
  id     name salary start_date    dept
3  3 Michelle 611.00 2014-11-15      IT
4  4     Ryan 729.00 2014-05-11      HR
5  5     Gary 843.25 2015-03-27 Finance
8  8     Guru 722.50 2014-06-17 Finance
> # Writing into CSV file
> write.csv(afyear,"output.csv")
> read.csv("output.csv")
  X id     name salary start_date    dept
1 3  3 Michelle 611.00 2014-11-15      IT
2 4  4     Ryan 729.00 2014-05-11      HR
3 5  5     Gary 843.25 2015-03-27 Finance
4 8  8     Guru 722.50 2014-06-17 Finance
```

Task – 04 :

Aim : load Excel file into R and do changes in data

Program :

```
install.packages("readxl")
library("readxl")
getwd()
setwd("E:/venkat sai/rstudio_language")
getwd()
```

```
read_excel("product_list.xlsx")
# writing into an excel file
install.packages("writexl")
library("writexl")
x = 10:1
y = -4:5
q =
c("Hockey","Football","Baseball","Curling","Rugby","Lacrosse","
Basketball","Tennis","Cricket","Soccer")
theDF = data.frame(x,y,q)
theDF
write_xlsx(theDF,"sports.xlsx")
```

Output :

```
> getwd()
[1] "E:/venkat sai/rstudio_language"
> setwd("E:/venkat sai/rstudio_language")
> getwd()
[1] "E:/venkat sai/rstudio_language"
> read_excel("product_list.xlsx")
# A tibble: 4 x 2
  Product      Price
  <chr>        <dbl>
1 Refrigerator  1200
2 Oven           750
3 Dishwasher     900
4 Coffee Maker   300
```

```
> x = 10:1
> y = -4:5
> q =
c("Hockey","Football","Baseball","Curling","Rugby","Lacrosse","
Basketball","Tennis","Cricket","Soccer")
> theDF = data.frame(x,y,q)
> theDF
   x  y          q
1  10 -4     Hockey
2   9 -3   Football
3   8 -2   Baseball
4   7 -1    Curling
5   6  0      Rugby
6   5  1   Lacrosse
7   4  2 Basketball
8   3  3     Tennis
9   2  4    Cricket
10  1  5     Soccer
> write_xlsx(theDF,"sports.xlsx")
```

Result : Successfully completed the 4 tasks

R LAB – 06

Task – 01 :

Aim : using the apply , aggregate , data.table functionalites manipulate the any one random data..

Program :

```
#  apply function
theMatrix = matrix(1:9, nrow = 3)
theMatrix
# 1 means sum of rows and 2 means sum of columns
apply(theMatrix, 1, sum)
apply(theMatrix, 2, sum)
theMatrix[2,3] <- NA
apply(theMatrix, 1, sum)
apply(theMatrix, 1, sum, na.rm = TRUE)
rowSums(theMatrix, na.rm = TRUE)
colSums(theMatrix, na.rm = TRUE)
# lapply & sapply functions

theList <- list(A = matrix(1:9,3), B = 1:5, C =
matrix(1:4,2), D = 2)
theList
lapply(theList, sum) # returns list
sapply(theList, sum) # returns data frame
```

```
theNames <- c("Tyson", "Rizwanullah", "Dragon Emperor", "A.Charan")
lapply(theNames,  nchar)
sapply(theNames, nchar)
# mapply function
f3 <- function(x,y)
{
  NROW(x) + NCOL(y)
}
flist = list(A = matrix(1:16,4), B = matrix(1:16,2), C = 1:5)
flist
slist = list(A = matrix(1:16,4), B = matrix(1:16,2), C = 15:1)
slist


mapply(identical, flist, slist)
mapply(f3, flist, slist)
# using aggregate function
eid = c(2501 : 2509)
eid
ename = c("Rizwan", "Ajay", "Mounav", "Charan", "Srinivas", "Vamsi", "Deepak", "Abhi", "Pavan")
ename
desig = c("sales", "accounts", "manager", "sales", "sales", "accounts", "accounts", "manager", "sales")
```

```
desig
dept_id = c(10,10,10,10,20,20,20,30,30)
dept_id
salary = c(23000, 35000, 40000, 80000, 230000, 98000,
50000, 85000, 130000)
salary
employee = data.frame(eid, ename, desig, dept_id,
salary)
employee
aggregate(salary~dept_id, employee, mean)
aggregate(salary~dept_id, employee, max)
aggregate(salary~dept_id+desig, employee, mean)
aggregate(salary~dept_id+desig, employee, min)
#data()
install.packages("plyr")
require("plyr")
#data(package = "plyr")
# using plyr package
employee1 = data.frame(eid, ename, desig, dept_id,
salary)
employee1
employee1$eid[employee1$salary < 36000] <- 0
employee1
any(is.na(employee1$eid))
```

```
# using data table
install.packages("data.table")
require("data.table")
theDT = data.table(eid, ename, desig, dept_id, salary)
theDT
class(theDT$ename)
class(employee1$ename)
theDT[1:2,]
theDT[theDT$eid >= 2504]
theDT[, list(eid,desig)]
theDT[, ename]
theDT[, list(ename)]
# if yu use column name as character name then yu should use with attribute
theDT[, "ename", with = FALSE]
theDT[, c("ename","eid"), with = FALSE]
# get all the tables
tables()
# setting the key in the data table
setkey(theDT, salary)
theDT
key(theDT)
tables()
theDT[theDT$salary > 50000]
```

```
setkey(theDT, desig, dept_id, salary)
tables()
theDT
# aggregate on data tables
theDT[, mean(salary), by = dept_id]
theDT[, list(price = mean(salary)), by = dept_id]
theDT[, mean(salary), by = list(dept_id,desig)]
theDT[, list(price = mean(salary), desig = mean(eid)), by
= dept_id]
#data()
```

Output :

```
> theMatrix = matrix(1:9, nrow = 3)
> theMatrix
     [,1] [,2] [,3]
[1,]    1    4    7
[2,]    2    5    8
[3,]    3    6    9
> apply(theMatrix, 1, sum)
[1] 12 15 18
> apply(theMatrix, 2, sum)
[1]  6 15 24
> theMatrix[2,3] <- NA
> apply(theMatrix, 1, sum)
```

```
[1] 12 NA 18
> apply(theMatrix, 1, sum, na.rm = TRUE)
[1] 12  7 18
> rowSums(theMatrix, na.rm = TRUE)
[1] 12  7 18
> colSums(theMatrix, na.rm = TRUE)
[1]  6 15 16
> theList <- list(A = matrix(1:9,3), B = 1:5, C =
matrix(1:4,2), D = 2)
> theList
$A
     [,1] [,2] [,3]
[1,]    1    4    7
[2,]    2    5    8
[3,]    3    6    9
$B
[1] 1 2 3 4 5
$C
     [,1] [,2]
[1,]    1    3
[2,]    2    4
$D
[1] 2
> lapply(theList, sum) # returns list
```

```
$A
[1] 45
$B
[1] 15
$C
[1] 10
$D
[1] 2
> sapply(theList, sum) # returns data frame
 A B  C D
45 15 10  2
> theNames <- c("Tyson", "Rizwanullah", "Dragon Emperor", "A.Charan")
> lapply(theNames, nchar)
[[1]]
[1] 5
[[2]]
[1] 11
[[3]]
[1] 14
[[4]]
[1] 8
> sapply(theNames, nchar)
```

```
        Tyson    Rizwanullah Dragon Emperor
A.Charan
            5            11            14            8
> f3 <- function(x,y)
+ {
+   NROW(x) + NCOL(y)
+ }
> flist = list(A = matrix(1:16,4), B = matrix(1:16,2), C =
1:5)
> flist
$A
     [,1] [,2] [,3] [,4]
[1,]    1    5    9   13
[2,]    2    6   10   14
[3,]    3    7   11   15
[4,]    4    8   12   16
$B
     [,1] [,2] [,3] [,4] [,5] [,6] [,7] [,8]
[1,]    1    3    5    7    9   11   13   15
[2,]    2    4    6    8   10   12   14   16
$C
[1] 1 2 3 4 5
> slist = list(A = matrix(1:16,4), B = matrix(1:16,2), C =
15:1)
```

```
> slist
$A
     [,1] [,2] [,3] [,4]
[1,]    1    5    9   13
[2,]    2    6   10   14
[3,]    3    7   11   15
[4,]    4    8   12   16
$B
     [,1] [,2] [,3] [,4] [,5] [,6] [,7] [,8]
[1,]    1    3    5    7    9   11   13   15
[2,]    2    4    6    8   10   12   14   16
$C
 [1] 15 14 13 12 11 10  9  8  7 6  5  4  3  2  1
> mapply(identical, flist, slist)
    A     B     C
 TRUE  TRUE FALSE
> mapply(f3, flist, slist)
 A B  C
 8 10  6
> eid = c(2501 : 2509)
> eid
[1] 2501 2502 2503 2504 2505 2506 2507 2508 2509
> ename = c("Rizwan", "Ajay", "Mounav", "Charan",
"Srinivas", "Vamsi", "Deepak", "Abhi", "Pavan")
```

```
> ename
[1] "Rizwan"   "Ajay"    "Mounav"  "Charan"  "Srinivas"
"Vamsi"   "Deepak"  "Abhi"    "Pavan"
> desig = c("sales", "accounts", "manager", "sales",
"sales", "accounts", "accounts", "manager", "sales")
> desig
[1] "sales"    "accounts" "manager"  "sales"    "sales"
"accounts" "accounts" "manager"  "sales"
> dept_id = c(10,10,10,10,20,20,20,30,30)
> dept_id
[1] 10 10 10 10 20 20 20 30 30
> salary = c(23000, 35000, 40000, 80000, 230000,
98000, 50000, 85000, 130000)
> salary
[1]  23000  35000  40000  80000 230000  98000  50000
85000 130000
> employee = data.frame(eid, ename, desig, dept_id,
salary)
> employee
  eid    ename    desig dept_id  salary
1 2501   Rizwan    sales      10  23000
2      2502                    Ajay accounts
  10  35000
3 2503   Mounav  manager      10  40000
4 2504   Charan    sales      10  80000
5 2505 Srinivas    sales      20 230000
```

```
6 2506    Vamsi accounts       20  98000
7 2507   Deepak accounts       20  50000
8 2508     Abhi  manager       30  85000
9 2509    Pavan    sales       30 130000
> aggregate(salary~dept_id, employee, mean)
  dept_id salary
1       10  44500
2       20 126000
3       30 107500
> aggregate(salary~dept_id, employee, max)
  dept_id salary
1       10  80000
2       20 230000
3       30 130000
> aggregate(salary~dept_id+desig, employee, mean)
  dept_id    desig salary
1       10 accounts  35000
2       20 accounts 740003
10     manager    40000  4
30  manager  850005  10
sales  51500
6       20    sales 230000
7       30    sales 130000
> aggregate(salary~dept_id+desig, employee, min)
```

```
  dept_id   desig   salary
1      10   accounts      35000
2      20    accounts     500003
10   manager     400004    30
manager     850005  10  sales
23000
6      20    sales          230000
7      30    sales          130000


> employee1 = data.frame(eid, ename, desig, dept_id,
salary)
> employee1
  eid    ename    desig dept_id  salary
1 2501   Rizwan    sales      10  23000
2      2502                    Ajay accounts
  10  35000
3 2503   Mounav  manager      10  40000
4 2504   Charan    sales      10  80000
5 2505 Srinivas    sales      20 230000
6 2506    Vamsi accounts      20  98000
7 2507   Deepak accounts      20  50000
8 2508     Abhi  manager      30  85000
9 2509    Pavan    sales      30 130000
> employee1$eid[employee1$salary < 36000] <- 0
> employee1
```

```
   eid    ename    desig dept_id salary
1    0   Rizwan    sales      10  23000
2    0     Ajay accounts      10  35000
3 2503   Mounav  manager      10  40000
4 2504   Charan    sales      10  80000
5 2505 Srinivas    sales      20 230000
6 2506    Vamsi accounts      20  98000
7 2507   Deepak accounts      20  50000
8 2508     Abhi  manager      30  85000
9 2509    Pavan    sales      30 130000
> any(is.na(employee1$eid))
[1] FALSE
> theDT = data.table(eid, ename, desig, dept_id, salary)
> theDT
    eid    ename    desig dept_id salary
1: 2501   Rizwan    sales      10  23000
2: 2502     Ajay accounts      10  35000
3: 2503   Mounav  manager      10  40000
4: 2504   Charan    sales      10  80000
5: 2505 Srinivas    sales      20 230000
6: 2506    Vamsi accounts      20  98000
7: 2507   Deepak accounts      20  50000
8: 2508     Abhi  manager      30  85000
9: 2509    Pavan    sales      30 130000
```

```
> class(theDT$ename)
[1] "character"
> class(employee1$ename)
[1] "character"
> theDT[1:2,]
   eid  ename    desig dept_id salary
1: 2501 Rizwan    sales      10  23000
2: 2502   Ajay accounts      10  35000
> theDT[theDT$eid >= 2504]
   eid    ename    desig dept_id salary
1: 2504   Charan    sales      10  80000
2: 2505 Srinivas    sales      20 230000
3: 2506    Vamsi accounts      20  98000
4: 2507   Deepak accounts      20  50000
5: 2508     Abhi  manager      30  85000
6: 2509    Pavan    sales      30 130000
> theDT[, list(eid,desig)]
   eid    desig
1: 2501    sales
2: 2502 accounts
3: 2503  manager
4: 2504    sales
5: 2505    sales
6: 2506 accounts
```

```
7: 2507 accounts
8: 2508  manager
9: 2509    sales
> theDT[, ename]
[1] "Rizwan"   "Ajay"     "Mounav"   "Charan"   "Srinivas"
"Vamsi"    "Deepak"   "Abhi"     "Pavan"
> theDT[, list(ename)]
      ename
1:   Rizwan
2:     Ajay
3:   Mounav
4:   Charan
5: Srinivas
6:    Vamsi
7:   Deepak
8:     Abhi
9:    Pavan
> theDT[, "ename", with = FALSE]
      ename
1:   Rizwan
2:     Ajay
3:   Mounav
4:   Charan
5: Srinivas
```

```
6:    Vamsi
7:   Deepak
8:     Abhi
9:    Pavan
> theDT[, c("ename","eid"), with = FALSE]
      ename  eid
1:   Rizwan 2501
2:     Ajay 2502
3:   Mounav 2503
4:   Charan 2504
5: Srinivas 2505
6:    Vamsi 2506
7:   Deepak 2507
8:     Abhi 2508
9:    Pavan 2509
> tables()
   NAME NROW NCOL MB                          COLS KEY
1: theDT    9    5 0 eid,ename,desig,dept_id,salary
Total: 0MB
> setkey(theDT, salary)
> theDT
   eid    ename    desig dept_id salary
1: 2501   Rizwan    sales      10  23000
2: 2502     Ajay accounts      10  35000
```

```
3: 2503   Mounav  manager      10  40000
4: 2507   Deepak accounts      20  50000
5: 2504   Charan    sales      10  80000
6: 2508    Abhi  manager      30  85000
7: 2506   Vamsi accounts      20  98000
8: 2509   Pavan    sales      30 130000
9: 2505 Srinivas    sales      20 230000
> key(theDT)
[1] "salary"
> tables()
   NAME NROW NCOL MB                          COLS
KEY
1: theDT    9    5 0 eid,ename,desig,dept_id,salary
salary
Total: 0MB
> theDT[theDT$salary > 50000]
   eid    ename    desig dept_id salary
1: 2504   Charan    sales      10  80000
2: 2508    Abhi  manager      30  85000
3: 2506   Vamsi accounts      20  98000
4: 2509   Pavan    sales      30 130000
5: 2505 Srinivas    sales      20 230000
> setkey(theDT, desig, dept_id, salary)
> tables()
```

```
   NAME NROW NCOL MB                         COLS
KEY
1: theDT    9    5 0 eid,ename,desig,dept_id,salary
desig,dept_id,salary
Total: 0MB
> theDT
   eid    ename    desig dept_id salary
1: 2502     Ajay accounts       10  35000
2: 2507   Deepak accounts       20  50000
3: 2506    Vamsi accounts       20  98000
4: 2503   Mounav  manager       10  40000
5: 2508     Abhi manager        30  85000
6: 2501   Rizwan    sales       10  23000
7: 2504   Charan    sales       10  80000
8: 2505 Srinivas    sales       20 230000
9: 2509    Pavan    sales       30 130000

> theDT[, mean(salary), by = dept_id]
   dept_id     V1
1:      10  44500
2:      20 126000
3:      30 107500
> theDT[, list(price = mean(salary)), by = dept_id]
   dept_id  price
```

```
1:      10  44500
2:      20 126000
3:      30 107500
>
> theDT[, mean(salary), by = list(dept_id,desig)]
   dept_id    desig     V1
1:      10 accounts  35000
2:      20 accounts  74000
3:      10  manager  40000
4:      30  manager  85000
5:      10    sales  51500
6:      20    sales 230000
7:      30    sales 130000
> theDT[, list(price = mean(salary), desig = mean(eid)),
by = dept_id]
   dept_id  price  desig
1:      10  44500 2502.5
2:      20 126000 2506.0
3:      30 107500 2508.5
```

Result : Successfully Completed the Aim

R LAB – 07

R LAB – 07

Task – 01 :

Aim : Apply cbind , rbind , cast , melt functions on any inbuilt dataset in R soft

- Ware .

Program :

```
# package installations

require("plyr")

library("plyr")


install.packages("data.table")

require("data.table")

library("data.table")


install.packages("reshape2")

require("reshape2")

library("reshape2")


sport <- c("Hockey", "Baseball", "Football")

league <- c("NHL", "MLB", "NFL")

trophy <- c("Stanley Cup", "Commissioner’s Trophy", "Vince Lombardi Trophy")

trophies1 <- cbind(sport,league,trophy) # vectors will become as columns

trophies0 <- rbind(sport,league,trophy) # vectors become as rows
```

```
trophies0
trophies1
class(trophies1)


trophies2<- data.frame(sport=c("Basketball", "Golf"),
league=c("NBA", "PGA"),
                       trophy=c("Larry Championship Trophy",
"Wanamaker Trophy"), stringsAsFactors=FALSE)
trophies2


trophies <- rbind(trophies1, trophies2)
trophies


# Doing the JOINS
getwd()
setwd("C:/Users/itadmin/Documents/")
getwd()


df1 = data.frame(StudentId = c(101:106),
                 Product = c("Hindi", "English",
                             "Maths", "Science",
                             "Political  Science",
                             "Physics"))
df1
df2 = data.frame(StudentId = c(102, 104, 106,
                               107, 108),
```

```
                State = c("Manglore", "Mysore",
                          "Pune", "Dehradun", "Delhi"))
df2

df = merge(x = df1, y = df2, by = "StudentId")
df
# left outer
df3 = merge(x = df1, y = df2, by = "StudentId",
            all.x = TRUE)
df3
# right outer
df4 = merge(x = df1, y = df2, by = "StudentId",
            all.y = TRUE)
df4
# full join
df5 = merge(x = df1, y = df2, by = "StudentId",
            all = TRUE)
df5
# cross join
df6 = merge(x = df1, y = df2, by = NULL)
df6
# semi join (doubt topic)
install.packages("dplyr")
library(dplyr)

df7 = df1 %>% semi_join(df2, by = "StudentId")
df7
```

```
# anti join (doubt topic)
df8 = df1 %>% anti_join(df2, by = "StudentId")
df8

# doing CAST and MELT
# 1. CAST : transforming rows into columns
# 2. MELT : transforming columns into row
# ships data set is a default dat set in the r packages.
install.packages("MASS")
install.packages("reshape")

library("MASS")
library("reshape")
library("reshape2")

ships
sd = (head(ships, n = 10)) # taking as data frame
class(sd)
# in id attribute putting the type and year column constant
molten_ships = melt(sd, id = c("type","year"))
molten_ships

rec <- reshape2::dcast(molten_ships, type+year~variable,sum)
rec
```

Output :

```
sport <- c("Hockey", "Baseball", "Football")

> league <- c("NHL", "MLB", "NFL")

> trophy <- c("Stanley Cup", "Commissioner’s Trophy", "Vince Lombardi Trophy")

> trophies1 <- cbind(sport,league,trophy) # vectors will become as columns

> trophies0 <- rbind(sport,league,trophy) # vectors become as rows

> trophies0

       [,1]          [,2]                  [,3]

sport  "Hockey"      "Baseball"            "Football"

league "NHL"         "MLB"                 "NFL"

trophy "Stanley Cup" "Commissioner’s Trophy" "Vince Lombardi Trophy"

> trophies1

     sport      league trophy

[1,] "Hockey"   "NHL"  "Stanley Cup"

[2,] "Baseball" "MLB" "Commissioner’s Trophy"

[3,] "Football" "NFL"  "Vince Lombardi Trophy"

> class(trophies1)

[1] "matrix" "array"


trophies2<- data.frame(sport=c("Basketball", "Golf"), league=c("NBA", "PGA"),

+                        trophy=c("Larry Championship Trophy", "Wanamaker Trophy"), stringsAsFactors=FALSE)

> trophies2
```

```
      sport league                  trophy
1 Basketball    NBA Larry Championship Trophy
2       Golf    PGA          Wanamaker Trophy
>
> trophies <- rbind(trophies1, trophies2)
> trophies
      sport league                  trophy
1     Hockey    NHL              Stanley Cup
2   Baseball    MLB     Commissioner’s Trophy
3   Football    NFL     Vince Lombardi Trophy
4 Basketball    NBA Larry Championship Trophy
5       Golf    PGA          Wanamaker Trophy

getwd()
[1] "E:/venkat sai/rstudio_language"
> setwd(choose.dir())
> getwd()
[1] "E:/venkat sai/rstudio_language"

df1 = data.frame(StudentId = c(101:106),
+                  Product = c("Hindi", "English",
+                              "Maths", "Science",
+                              "Political Science",
+                              "Physics"))
> df1
  StudentId          Product
```

```
1       101            Hindi
2       102          English
3       103            Maths
4       104          Science
5       105 Political Science
6       106          Physics
>
> df2 = data.frame(StudentId = c(102, 104, 106,
+                                107, 108),
+                  State = c("Manglore", "Mysore",
+                            "Pune", "Dehradun", "Delhi"))
> df2
  StudentId    State
1       102 Manglore
2       104   Mysore
3       106     Pune
4       107 Dehradun
5       108    Delhi

df = merge(x = df1, y = df2, by = "StudentId")
> df
  StudentId Product    State
1       102 English Manglore
2       104 Science   Mysore
3       106 Physics     Pune
>
```

```
> # left outer
> df3 = merge(x = df1, y = df2, by = "StudentId",
+           all.x = TRUE)
> df3
  StudentId          Product    State
1       101            Hindi     <NA>
2       102          English Manglore
3       103            Maths     <NA>
4       104          Science   Mysore
5       105 Political Science     <NA>
6       106          Physics     Pune
>
> # right outer
> df4 = merge(x = df1, y = df2, by = "StudentId",
+           all.y = TRUE)
> df4
  StudentId Product    State
1       102 English Manglore
2       104 Science   Mysore
3       106 Physics     Pune
4       107    <NA> Dehradun
5       108    <NA>    Delhi
>
> # full join
> df5 = merge(x = df1, y = df2, by = "StudentId",
+           all = TRUE)
```

```
> df5
  StudentId          Product    State
1       101            Hindi     <NA>
2       102          English Manglore
3       103            Maths     <NA>
4       104          Science   Mysore
5       105 Political Science     <NA>
6       106          Physics     Pune
7       107             <NA> Dehradun
8       108             <NA>    Delhi
>
> # cross join
> df6 = merge(x = df1, y = df2, by = NULL)
> df6
   StudentId.x          Product StudentId.y    State
1          101            Hindi         102 Manglore
2          102          English         102 Manglore
3          103            Maths         102 Manglore
4          104          Science         102 Manglore
5          105 Pol tical Science         102 Manglo e
6          106          Physics         102 Manglore
7          101            Hindi         104   Mysore
8          102          English         104   Mysore
9          103            Maths         104   Mysore
10         104          Science         104   Mysore
11         105 Political Science         104   Mysore
```

12 106 Physics 104 Mysore
13 101 Hindi 106 Pune
14 102 English 106 Pune
15 103 Maths 106 Pune
16 104 Science 106 Pune
17 105 Political Science 106 Pune
18 106 Physics 106 Pune
19 101 Hindi 107 Dehradun
20 102 English 107 Dehradun
21 103 Maths 107 Dehradun
22 104 Science 107 Dehradun
23 105 Political Science 107 Dehradun
24 106 Physics 107 Dehradun
25 101 Hindi 108 Delhi
26 102 English 108 Delhi
27 103 Maths 108 Delhi
28 104 Science 108 Delhi
29 105 Political Science 108 Delhi
30 106 Physics 108 Delhi

```
df7 = df1 %>% semi_join(df2, by = "StudentId")
> df7
  StudentId Product
1       102 English
2       104 Science
3       106 Physics
```

```
>
> # anti join (doubt topic)
> df8 = df1 %>% anti_join(df2, by = "StudentId")
> df8
  StudentId          Product
1       101            Hindi
2       103            Maths
3       105 Political Science


library("reshape2")
> ships
   type year period service incidents
1     A   60     60     127         0
2     A   60     75      63         0
3     A   65     60    1095         3
4     A   65     75    1095         4
5     A   70     60    1512         6
6     A   70     75    3353        18
7     A   75     60       0         0
8     A   75     75    2244        11
9     B   60     60   44882        39
10    B   60     75   17176        29
11    B   65     60   28609        58
12    B   65     75   20370        53
13    B   70     60    7064        12
14    B   70     75   13099        44
```

15	B	75	60	0	0
16	B	75	75	7117	18
17	C	60	60	1179	1
18	C	60	75	552	1
19	C	65	60	781	0
20	C	65	75	676	1
21	C	70	60	783	6
22	C	70	75	1948	2
23	C	75	60	0	0
24	C	75	75	274	1
25	D	60	60	251	0
26	D	60	75	105	0
27	D	65	60	288	0
28	D	65	75	192	0
29	D	70	60	349	2
30	D	70	75	1208	11
31	D	75	60	0	0
32	D	75	75	2051	4
33	E	60	60	45	0
34	E	60	75	0	0
35	E	65	60	789	7
36	E	65	75	437	7
37	E	70	60	1157	5
38	E	70	75	2161	12
39	E	75	60	0	0
40	E	75	75	542	1

```
> sd = (head(ships, n = 10)) # taking as data frame
> class(sd)
[1] "data.frame"

molten_ships = melt(sd, id = c("type","year"))
> molten_ships
   type year  variable value
1     A   60    period    60
2     A   60    period    75
3     A   65    period    60
4     A   65    period    75
5     A   70    period    60
6     A   70    period    75
7     A   75    period    60
8     A   75    period    75
9     B   60    period    60
10    B   60    period    75
11    A   60   service   127
12    A   60   service    63
13    A   65   service  1095
14    A   65   service  1095
15    A   70   service  1512
16    A   70   service  3353
17    A   75   service     0
18    A   75   service  2244
19    B   60   service 44882
```

```
20    B   60   service 17176
21    A   60 incidents     0
22    A   60 incidents     0
23    A   65 incidents     3
24    A   65 incidents     4
25    A   70 incidents     6
26    A   70 incidents    18
27    A   75 incidents     0
28    A   75 incidents    11
29    B   60 incidents    39
30    B   60 incidents    29
```

```
rec <- dcast(molten_ships, type+year~variable,sum)
> rec
  type year period service incidents
1    A   60    135     190         0
2    A   65    135    2190         7
3    A   70    135    4865        24
4    A   75    135    2244        11
5    B   60    135   62058        68
```

Result : Successfully executed all lines in the program…

R LAB – 08

Task – 01 :

Aim : Apply R math functions in a data or any dataset

Program :

```
# Doing Math With Simulation R
# Computing the probabilites of the given vector
exact_one = function(p)
{
  notp = 1 - p
  tot = 0.0

  for(i in 1:length(p))
  {
    tot = tot + p[i] + prod(notp[-i])
  }

  return(tot)
}

v1 = c(1,2,3,4,5)
a1 = exact_one(v1)
```

```
a1


# Cumulative Sum and Product Of an Vector
cumsum(v1)
cumprod(v1)

# minima and maxima
mat1 <- matrix(c(1,5,6,2,3,2), nrow = 3)
mat1

min(mat1[,1], mat1[,2])
pmin(mat1[,1], mat1[,2])
pmin(mat1[1,], mat1[2,], mat1[3,])

# Sorting in R
unsort = c(13,2,5,2,3)
sort(unsort)
unsort
order(unsort) # it will get the indices of the sorted values in the original vector

# sorting the dataframe
v2 = c('def', 'ab', 'zzzz')
v3 = c(2,5,1)
```

```
y = data.frame(v1 = v2, v2 = v3)
y

r <- order(y$v2)
r

z <- y[r,]
z

rank(v3)
rank(v1)

# Linear ALgebra
crossprod(1:3,c(5,12,13)) #  1*5 + 2*12 + 3*13 = 68

# Matrix Multiplication
a = matrix(1:4, ncol = 2, byrow = TRUE)
a
b = matrix(c(1,0,-1,1), nrow = 2)
b

mat_mul = a %*% b
mat_mul
```

```
# solving the equations
s1 = matrix(c(1,1,-1,1), nrow = 2, ncol = 2)
s2 = c(2,4)
solve(s1,s2)
solve(s1)

# matrix Transpose
q1 = matrix(1:9, nrow = 3, byrow = TRUE)
q1

t(q1)

# determinent of matrix
det(q1)

# finding the eigen values
eigen(q1)

# Set operations in R
p <- c(1,2,5)
q <- c(5,1,8,9)

union(p,q)
intersect(p,q)
```

```
setdiff(p,q)
setdiff(q,p)

setequal(p,q)
setequal(p, c(1,2,5))

5 %in% p
10 %in% q

choose(5,3)

# Finding Symmetric Difference
symetric = function(a,b)
{
  sx = setdiff(a,b)
  sy = setdiff(b,a)
  result = union(sx,sy)

  return(result)
}

f = c(1,2,5)
g = c(5,1,8,9)
```

```
ans = symetric(f,g)
ans
```

Output :

```
exact_one = function(p)
+ {
+   notp = 1 - p
+   tot = 0.0
+
+   for(i in 1:length(p))
+   {
+     tot = tot + p[i] + prod(notp[-i])
+   }
+
+   return(tot)
+ }
>
> v1 = c(1,2,3,4,5)
> a1 = exact_one(v1)
> a1
[1] 39
> cumsum(v1)
[1]  1  3  6 10 15
> cumprod(v1)
[1]   1   2   6  24 120
```

```
> mat1 <- matrix(c(1,5,6,2,3,2), nrow = 3)
> mat1
     [,1] [,2]
[1,]    1    2
[2,]    5    3
[3,]    6    2
> min(mat1[,1], mat1[,2])
[1] 1
> pmin(mat1[,1], mat1[,2])
[1] 1 3 2
> pmin(mat1[1,], mat1[2,], mat1[3,])
[1] 1 2
> unsort = c(13,2,5,2,3)
> sort(unsort)
[1]  2  2  3  5 13
> unsort
[1] 13  2  5  2  3
> order(unsort)
[1] 2 4 5 3 1
> v2 = c('def', 'ab', 'zzzz')
> v3 = c(2,5,1)
> y = data.frame(v1 = v2, v2 = v3)
> y
    v1 v2
```

```
1  def  2
2   ab  5
3 zzzz  1
> r <- order(y$v2)
> r
[1] 3 1 2
>
> z <- y[r,]
> z
    v1 v2
3 zzzz  1
1  def  2
2   ab  5
> rank(v3)
[1] 2 3 1
> rank(v1)
[1] 1 2 3 4 5
> crossprod(1:3,c(5,12,13))
     [,1]
[1,]   68
> a = matrix(1:4, ncol = 2, byrow = TRUE)
> a
     [,1] [,2]
[1,]    1    2
```

```
[2,]    3    4
> b = matrix(c(1,0,-1,1), nrow = 2)
> b
     [,1] [,2]
[1,]    1   -1
[2,]    0    1
>
> mat_mul = a %*% b
> mat_mul
     [,1] [,2]
[1,]    1    1
[2,]    3    1
> s1 = matrix(c(1,1,-1,1), nrow = 2, ncol = 2)
> s2 = c(2,4)
> solve(s1,s2)
[1] 3 1
> solve(s1)
     [,1] [,2]
[1,]  0.5  0.5
[2,] -0.5  0.5
> q1 = matrix(1:9, nrow = 3, byrow = TRUE)
> q1
     [,1] [,2] [,3]
[1,]    1    2    3
```

```
[2,]    4    5    6
[3,]    7    8    9
> t(q1)
     [,1] [,2] [,3]
[1,]    1    4    7
[2,]    2    5    8
[3,]    3    6    9
> det(q1)
[1] 6.661338e-16
> eigen(q1)
eigen() decomposition
$values
[1]  1.611684e+01 -1.116844e+00 -1.303678e-15

$vectors
           [,1]       [,2]       [,3]
[1,] -0.2319707 -0.78583024  0.4082483
[2,] -0.5253221 -0.08675134 -0.8164966
[3,] -0.8186735  0.61232756  0.4082483

> p <- c(1,2,5)
> q <- c(5,1,8,9)
> union(p,q)
[1] 1 2 5 8 9
```

```
> intersect(p,q)
[1] 1 5
>
> setdiff(p,q)
[1] 2
> setdiff(q,p)
[1] 8 9
>
> setequal(p,q)
[1] FALSE
> setequal(p, c(1,2,5))
[1] TRUE
>
> 5 %in% p
[1] TRUE
> 10 %in% q
[1] FALSE
>
> choose(5,3)
[1] 10
> symetric = function(a,b)
+ {
+   sx = setdiff(a,b)
+   sy = setdiff(b,a)
```

```
+   result = union(sx,sy)
+
+   return(result)
+ }
> f = c(1,2,5)
> g = c(5,1,8,9)
> ans = symetric(f,g)
> ans
[1] 2 8 9
```

Result : Successfully Executed the all lines in R