ITA0448-STATISTICS WITH R PROGRAMMING   S .Dhanush kumar

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ASSESSEMENT DAY 3

1. **How to use the cbind() and rbind() in data frame for the fields city and zipcodedatas using vector and data frame.**

Create a vectors:

cbind() function: Output:

```
          city           zipcode

[1]       delhi          123456
[2]        bangalore     789654
[3]       chennai        698748
[4]       mumbai         456986
```

PROGRAM:

```
city<-c("delhi","bangalore","chennai","mumbai")
zipcode<-c(123456,789654,698748,456986)
cbind(city,zipcode)
```

Output:

```
city          zipcode    [1,]
"delhi"    "123456"
[2,] "bangalore" "789654"
[3,] "chennai"   "698748"
[4,] "mumbai"    "456986"
```

rbind() function:

Output:

```
          city            zipcode

[1]      delhi    123456
[2]      bangalore       789654
[3]      chennai         698748
[4]      mumbai          456986
[5]      punjab          456978 [6]      kerala  569875
```

PROGRAM:

city<-c("delhi","bangalore","chennai","mumbai") zipcode<-c(123456,789654,698748,456986) cbind(city,zipcode) r1<-c("delhi",123456) r2<-

c("bangalore",789654) r3<-c("chennai",698748) r4<-c("mumbai",456986) r5<-c("punjab",456978) r6<-c("kerala",569875) rbind(r1,r2,r3,r4,r5,r6) **Output:**

```
[,1]      [,2]
r1  "delhi"       "123456"  r2
"bangalore"   "789654"   r3
"chennai"      "698748"   r4
"mumbai"       "456986"  r5
"punjab"        "456978"   r6
"kerala"    "569875"
```

2. **Create First Dataset with variables**
   - **surname**
   - **nationality**

Create Second Dataset with variables

- **surname • movies**

The common key variable is surname. How to merge both data and check if the dimensionality is 7x3.

Output:

```
   surname      nationality            movies
 1 Hitchcock        UK                 Psycho
 2 Hitchcock        UK                  North by Northwest
3 Polanski                   Poland                        Chinatown
4 Scorsese                   US                   Taxi Driver
5 Spielberg         US                 Super 8
6 Spielberg         US                  Catch Me If You Can
7 Tarantino         US                  Reservoir Dogs
```

PROGRAM:

3. **Write a R program to create an empty data frame.**

Output:

```
[1] "Structure of the empty dataframe:" 'data.frame': 0
obs. of  5 variables:
 $ Ints  : int
 $ Doubles   : num
 $ Characters: chr
 $ Logicals  :logi
 $ Factors   : Factor w/ 0 levels:
NULL
```

PROGRAM:

```
df = data.frame(Ints=integer(),
Doubles=double(),
            Characters=character(),
            Logicals=logical(),
Factors=factor(),
stringsAsFactors=FALSE) print("Structure of the
empty dataframe:") print(str(df))
```

Output:

```
 'data.frame':        0 obs. of  5 variables:
 $ Ints      : int
 $ Doubles   : num
 $ Characters: chr
 $ Logicals  : logi
 $ Factors   : Factor w/ 0 levels:
NULL
```

4. Write a R program to create a data frame from four given vectors

```
name = c('Anastasia', 'Dima', 'Katherine', 'James', 'Emily', 'Michael',
'Matthew', 'Laura', 'Kevin', 'Jonas')
score = c(12.5, 9, 16.5, 12, 9, 20, 14.5, 13.5, 8, 19) attempts = c(1,
3, 2, 3, 2, 3, 1, 1, 2, 1)
qualify = c('yes', 'no', 'yes', 'no', 'no', 'yes', 'yes', 'no', 'no', 'yes')
```

Output:

```
[1] "Original data frame:"
 [1] "Anastasia" "Dima"      "Katherine" "James"     "Emily"     "Michael"
 [7] "Matthew"   "Laura"     "Kevin"     "Jonas"
 [1] 12.5  9.0 16.5 12.0  9.0 20.0 14.5 13.5  8.0 19.0
 [1] 1 3 2 3 2 3 1 1 2 1
 [1] "yes" "no"  "yes" "no"  "no"  "yes" "yes" "no"  "no"  "yes"
        name   score   attempts       qualify 1        Anastasia
12.5                     1       yes
2       Dima           9.0               3                no
3       Katherine      16.5              2       yes
4       James                  12.0              3        no
5       Emily    9.0                     2                no
6       Michael        20.0                      3       yes
7       Matthew        14.5              1       yes
8       Laura          13.5              1        no
9       Kevin                  8.0                       2        no
10      Jonas          19.0              1                yes
```

PROGRAM:

```
name<-
c("Anastasia","Dima","Katherine","James","Emily","Michael","Matthew","Laura","Ke
vin","Jonas")
score<-c(12.5,9,16.5,12,9,20,14.5,13.5,8,19)
Attempts<-c(1,3,2,3,2,3,1,1,2,1)
Qualify<-c("yes","no","yes","no","no","yes","yes","no","no","yes") df<-
data.frame(name,score,Attempts,Qualify) df
```

Output:

```
 name score Attempts Qualify
1       Anastasia  12.5       1     yes
2       Dima   9.0       3      no
3       Katherine  16.5       2     yes
4       James  12.0       3      no
5       Emily   9.0       2      no
6       Michael  20.0       3     yes
7       Matthew  14.5       1     yes
8       Laura  13.5       1      no
9       Kevin   8.0       2      no
10      Jonas  19.0       1     yes
```

5. Write a R program to extract specific column from a data frame using column name.

Output:

```
[1] "Original dataframe:"        name
score attempts qualify
1       Anastasia  12.5       1     yes
2       Dima   9.0       3      no
3       Katherine  16.5       2     yes
4       James  12.0       3      no
5       Emily   9.0       2      no
6       Michael  20.0       3     yes
7       Matthew  14.5       1     yes
8       Laura  13.5       1      no
9       Kevin   8.0       2      no
10      Jonas  19.0       1     yes [1] "Extract Specific columns:"
        exam_data.name exam_data.score
1            Anastasia           12.5
2            Dima            9.0
3            Katherine           16.5
4            James           12.0 5         Emily           9.0
6            Michael          20.0
```

```
7          Matthew          14.5
8          Laura        13.5
9          Kevin         8.0
10         Jonas        19.0
```

PROGRAM:

```
name<-
c("Anastasia","Dima","Katherine","James","Emily","Michael","Matthew","Lau
ra","Kevin","Jonas")
score<-c(12.5,9,16.5,12,9,20,14.5,13.5,8,19)
Attempts<-c(1,3,2,3,2,3,1,1,2,1)
Qualify<-c("yes","no","yes","no","no","yes","yes","no","no","yes")
df<-data.frame(name,score,Attempts,Qualify)
result<-(data.frame(df$name,df$score)) result
```

Output:

```
df.name df.score
1      Anastasia     12.5
2      Dima      9.0
3      Katherine     16.5
4      James     12.0
5      Emily     9.0
6      Michael     20.0
7      Matthew     14.5
8      Laura     13.5
9      Kevin      8.0
10     Jonas     19.0
```

6.Write a R program to extract first two rows from a given data frame.

Output:

```
[1] "Original dataframe:"        name
score attempts qualify
1      Anastasia  12.5       1     yes
2      Dima   9.0       3      no
3      Katherine  16.5       2     yes
4      James  12.0       3      no
5      Emily   9.0       2      no
6      Michael  20.0       3     yes
7      Matthew  14.5       1     yes
8      Laura  13.5       1      no
```

```
9       Kevin   8.0       2      no
10      Jonas  19.0       1      yes [1] "Extract first two rows:"        name
        score attempts qualify 1 Anastasia  12.5       1     yes 2      Dima
        9.0       3      no
```

PROGRAM:

```
name<-c("Anastasia","Dima","Katherine","James","Emily","Michael","Matthew","Laura","Kevin","Jonas")
score<-c(12.5,9,16.5,12,9,20,14.5,13.5,8,19)
Attempts<-c(1,3,2,3,2,3,1,1,2,1)
Qualify<-c("yes","no","yes","no","no","yes","yes","no","no","yes")
df<-data.frame(name,score,Attempts,Qualify)
result =df[c(1,2),c(1,2,3,4)]
print(result)
```

Output:

```
name score Attempts Qualify
1      Anastasia  12.5       1     yes
2      Dima   9.0       3      no
```

7.Write a R program to extract 3rd and 5th rows with 1st and 3rd columns from a given data frame.

Output:

```
[1] "Original dataframe:"        name
score attempts qualify
1       Anastasia  12.5       1     yes
2       Dima   9.0       3      no
3       Katherine  16.5       2     yes
4       James  12.0       3      no
5       Emily   9.0       2      no
6       Michael  20.0       3     yes
7       Matthew  14.5       1     yes
8       Laura  13.5       1      no
9       Kevin   8.0       2      no
```

```
10      Jonas  19.0       1      yes
[1] "Extract 3rd and 5th rows with 1st and 3rd columns :"
```

```
      name attempts
3         Katherine       2
5    Emily       2
```

PROGRAM:

```
name<-
c("Anastasia","Dima","Katherine","James","Emily","Michael","Matthew","Laura","Ke
vin","Jonas")
score<-c(12.5,9,16.5,12,9,20,14.5,13.5,8,19)
Attempts<-c(1,3,2,3,2,3,1,1,2,1)
Qualify<-c("yes","no","yes","no","no","yes","yes","no","no","yes")
df<-data.frame(name,score,Attempts,Qualify)
result =df[c(3,5),c(1,3)]
print(result)
```

Output:

```
name Attempts
3 Katherine       2
5     Emily       2
```

6.Write a R program to add a new column in a given data frame

Output:

```
[1] "Original dataframe:"        name
score attempts qualify
1       Anastasia  12.5       1     yes
2       Dima   9.0       3      no
3       Katherine  16.5       2     yes
4       James  12.0       3      no
5       Emily   9.0       2      no
6       Michael  20.0       3     yes
7       Matthew  14.5       1     yes
8       Laura  13.5       1      no
9       Kevin   8.0       2      no
10      Jonas  19.0       1     yes
[1] "New data frame after adding the 'country' column:"
      name score attempts qualify country
1       Anastasia  12.5       1     yes     USA
2       Dima   9.0       3      no     USA
3       Katherine  16.5       2     yes     USA
4       James  12.0       3      no     USA
5       Emily   9.0       2      no     USA
6       Michael  20.0       3     yes     USA
7       Matthew  14.5       1     yes     USA
8       Laura  13.5       1      no     USA
9       Kevin   8.0       2      no     USA 10     Jonas  19.0       1     yes
        USA
```

PROGRAM:

```
name<-
c('Anastasia','Dima','Katherine','James','Emily','Michael','Matthew','Laura','K
evin','Jonas') score <-c(12.5,9,16.5,12,9,20,14.5,13.5,8,19) attempts<-c(1, 3, 2, 3, 2,
3, 1, 1, 2, 1)
qualify <-c('yes', 'no', 'yes', 'no', 'no', 'yes', 'yes', 'no', 'no', 'yes')
exam<-data.frame(name,score,attempts,qualify) print("New data
frame after adding the 'country' column:") exam$country =
c("USA","USA","USA","USA","USA","USA","USA","USA","USA","USA") exam
```

Output:

```
name score attempts qualify country
1     Anastasia  12.5     1    yes    USA
2     Dima   9.0      3     no    USA
3     Katherine  16.5     2    yes    USA
4     James  12.0      3     no    USA
5     Emily   9.0      2     no    USA
6     Michael  20.0      3    yes    USA
7     Matthew  14.5      1    yes    USA
8     Laura  13.5      1     no    USA
9     Kevin   8.0      2     no    USA
10    Jonas  19.0      1    yes    USA
```

8.Write a R program to add new row(s) to an existing data frame.

Output:

```
[1] "Original dataframe:"        name
score attempts qualify
1      Anastasia  12.5      1    yes
2      Dima   9.0       3     no
3      Katherine  16.5      2    yes
4      James  12.0       3     no
5      Emily   9.0       2     no
6      Michael  20.0      3    yes
7      Matthew  14.5      1    yes
8      Laura  13.5       1     no
9      Kevin   8.0       2     no
10     Jonas  19.0       1    yes
[1] "After adding new row(s) to an existing data frame:"        name
score attempts qualify
1      Anastasia  12.5      1    yes
2      Dima   9.0       3     no
3      Katherine  16.5      2    yes
4      James  12.0       3     no
5      Emily   9.0       2     no
6      Michael  20.0      3    yes
```

```
7       Matthew  14.5       1     yes
8       Laura  13.5       1      no
9       Kevin   8.0       2      no
10      Jonas  19.0       1     yes
11      Robert  10.5       1     yes
12      Sophia   9.0       3      no
```

PROGRAM:

```
name<-
c("Anastasia","Dima","Katherine","James","Emily","Michael","Matthew","Laura","Ke
vin","Jonas") score<-c(12.5,9,16.5,12,9,20,14.5,13.5,8,19)

Attempts<-c(1,3,2,3,2,3,1,1,2,1)

Qualify<-c("yes","no","yes","no","no","yes","yes","no","no","yes") df<-

data.frame(name,score,Attempts,Qualify)

df name<-c("Robert","Sophia")

score<-c(10.5,9)

Attempts<-c(1,3) Qualify<-c("yes","no") new<-

data.frame(name,score,Attempts,Qualify) a<-

rbind(df,new) print("After adding rows to an existing

dataframe") print(a)
```

Output:

```
"After adding rows to an existing dataframe"

> print(a)        name score Attempts

Qualify

1       Anastasia  12.5     1     yes

2       Dima   9.0         3      no

    3         Katherine  16.5     2     yes
```

```
4       James  12.0     3      no

5       Emily   9.0         2      no

6       Michael  20.0     3     yes

7       Matthew  14.5              1     yes

8       Laura  13.5     1      no

9       Kevin   8.0         2      no

10      Jonas  19.0     1     yes

11      Robert  10.5     1     yes

12      Sophia   9.0     3      no
```

10.Write a R program to drop column(s) by name from a given data frame.

Output:

```
[1] "Original dataframe:"        name
score attempts qualify
1       Anastasia  12.5        1     yes
2       Dima   9.0        3      no
3       Katherine  16.5        2     yes
4       James  12.0        3      no
5       Emily   9.0        2      no
6       Michael  20.0        3     yes
7       Matthew  14.5        1     yes
8       Laura  13.5        1      no
9       Kevin   8.0        2      no 10     Jonas  19.0        1     yes
   score attempts
1     12.5        1
2     9.0        3
3     16.5        2
4     12.0        3
5     9.0        2
6     20.0        3
7     14.5        1
8     13.5        1
9     8.0        2
```

```
10   19.0       1
```

PROGRAM:

```
name<-
c('Anastasia','Dima','Katherine','James','Emily','Michael','Matthew','Laura','K
evin','Jonas')
score <-c(12.5,9,16.5,12,9,20,14.5,13.5,8,19) attempts<-c(1, 3, 2, 3,
2, 3, 1, 1, 2, 1)
qualify <-c('yes', 'no', 'yes', 'no', 'no', 'yes', 'yes', 'no', 'no', 'yes') exam<-
data.frame(name,score,attempts,qualify)
exam<-subset(exam,select = -c(name, qualify)) exam
```

Output:

```
 score attempts
1    12.5       1
2    9.0       3
3    16.5       2
4    12.0       3
5    9.0       2
6    20.0       3
7    14.5       1
8    13.5       1
9    8.0       2
10  19.0       1
```

11.Write a R program to drop row(s) by number from a given data frame.

Output:

```
[1] "Original dataframe:"        name
score attempts qualify
1  Anastasia  12.5       1     yes
2  Dima   9.0       3      no
3  Katherine  16.5       2     yes
4  James  12.0       3      no
5  Emily   9.0       2      no
6  Michael  20.0       3     yes
7  Matthew  14.5       1     yes
8  Laura  13.5       1      no
9  Kevin   8.0       2      no
10Jonas  19.0       1     yes        name score attempts qualify 1  Anastasia
   12.5       1     yes
3  Katherine  16.5       2     yes
5     Emily   9.0       2      no
7  Matthew  14.5       1     yes
8  Laura  13.5       1      no
9  Kevin   8.0       2      no
10 Jonas  19.0       1     yes
```

PROGRAM:
```
name<-
c('Anastasia','Dima','Katherine','James','Emily','Michael','Matthew','Laura','Kevi n','Jonas')
score <-c(12.5,9,16.5,12,9,20,14.5,13.5,8,19) attempts<-c(1, 3, 2,
3, 2, 3, 1, 1, 2, 1)
qualify <-c('yes', 'no', 'yes', 'no', 'no', 'yes', 'yes', 'no', 'no', 'yes') exam<-
data.frame(name,score,attempts,qualify)
exam<- exam[-c(2, 4, 6),]
exam
```

Output:

```
name score attempts qualify
1  Anastasia  12.5       1     yes
3  Katherine  16.5       2     yes
5     Emily   9.0       2      no
7       Matthew  14.5       1      yes
8       Laura  13.5       1      no
9       Kevin   8.0       2      no
10      Jonas  19.0       1      yes
```

12.Write a R program to sort a given data frame by multiple column(s).

Output:

```
[1] "Original dataframe:"        name
score attempts qualify
1       Anastasia  12.5       1     yes
2       Dima   9.0       3      no
3       Katherine  16.5       2     yes
4       James  12.0       3      no
5       Emily   9.0       2      no
6       Michael  20.0       3     yes
7       Matthew  14.5       1     yes
8       Laura  13.5       1      no
9       Kevin   8.0       2      no
10      Jonas  19.0       1     yes
[1] "dataframe after sorting 'name' and 'score' columns:"
       name score attempts qualify
1      Anastasia  12.5       1     yes
2      Dima   9.0       3      no
5     Emily   9.0       2      no
4     James  12.0       3      no
10     Jonas  19.0       1     yes
3      Katherine  16.5       2     yes
9     Kevin   8.0       2      no
8     Laura  13.5       1      no
```

```
7   Matthew  14.5       1     yes 6
Michael  20.0       3     yes
```

PROGRAM:

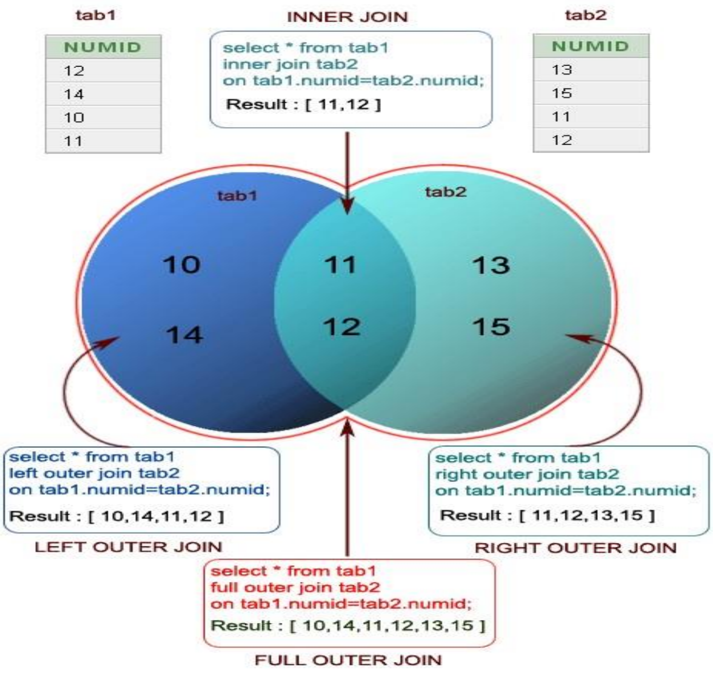
```
name<-
c('Anastasia','Dima','Katherine','James','Emily','Michael','Matthew','Laura','K
evin','Jonas')
score <-c(12.5,9,16.5,12,9,20,14.5,13.5,8,19) attempts<-c(1, 3, 2, 3,
2, 3, 1, 1, 2, 1)
qualify <-c('yes', 'no', 'yes', 'no', 'no', 'yes', 'yes', 'no', 'no', 'yes') exam<-
data.frame(name,score,attempts,qualify) print("dataframe after sorting
'name' and 'score' columns:")
exam<-exam[with(exam,order(name, score)), ]
print(exam)
```

Output:

```
name score attempts qualify
1       Anastasia  12.5       1     yes
2       Dima   9.0       3      no
5     Emily   9.0       2      no
4     James  12.0       3      no
10    Jonas  19.0       1      yes
3  Katherine  16.5       2     yes
9     Kevin   8.0       2      no
8     Laura  13.5       1      no
7    Matthew  14.5       1     yes
6    Michael  20.0       3     yes
```

13.Write a R program to create inner, outer, left, right join(merge) from given two data frames.

Output:



tab1

NUMID
12
14
10
11

tab2

NUMID
13
15
11
12

INNER JOIN

```
select * from tab1
inner join tab2
on tab1.numid=tab2.numid;
Result : [ 11,12 ]
```

LEFT OUTER JOIN

```
select * from tab1
left outer join tab2
on tab1.numid=tab2.numid;
Result : [ 10,14,11,12 ]
```

RIGHT OUTER JOIN

```
select * from tab1
right outer join tab2
on tab1.numid=tab2.numid;
Result : [ 11,12,13,15 ]
```

FULL OUTER JOIN

```
select * from tab1
full outer join tab2
on tab1.numid=tab2.numid;
Result : [ 10,14,11,12,13,15 ]
```

```
[1] "Left outer Join:"
numid
1    10
```

```
2   11
3   12
4   14
[1] "Right outer Join:" numid
1    11
2    12
3    13
4    15
[1] "Outer Join:"
numid
1   10
2   11
3   12
4   13
5   14
6   15
[1] "Cross Join:" numid.xnumid.y
1  12      13
2  14      13
3  10      13
4  11      13
5  12      15
6  14      15
7  10      15
8  11      15
9      12                                                                          16
10     14                                                                          16
11     10                                                                          16
12     11                                                                          16
13     12                                                                          16
14     14                                                                          16
15     10                                                                          17
16     11                                                                          17
```

PROGRAM:

```
df1<-data.frame(numid = c(12, 14, 10, 11)) df2<-data.frame(numid = c(13,
15, 11, 12))
print("Left outer Join:")
result<-merge(df1, df2, by = "numid", all.x = TRUE)
print(result) print("Right
outer Join:")
```

```
result<-merge(df1, df2, by = "numid", all.y = TRUE)
print(result) print("Outer
Join:") result<-merge(df1,
df2, by = "numid", all =
TRUE)
print(result) print("Cross Join:")
result<-merge(df1, df2, by = NULL)
print(result)
```

Output:

```
print(result)   numid
1    10
2    11
3     12
4     14
> print("Right outer Join:")
[1] "Right outer Join:"
> result<-merge(df1, df2, by = "numid", all.y = TRUE)
> print(result)   numid
1     11
2     12
3     13
4     15
> print("Outer Join:")
[1] "Outer Join:"
> result<-merge(df1, df2, by = "numid", all = TRUE)
> print(result)   numid
1     10
2     11
3     12
4     13
5     14
6     15
> print("Cross Join:")
[1] "Cross Join:"
> result<-merge(df1, df2, by = NULL)
> print(result)    numid.x
numid.y
1         12      13
2         14      13
3         10      13
```

```
4       11    13
5       12    15
6       14    15
7       10    15
8       11    15
9       12    11
10      14    11
11      10    11
12      11    11
13      12    12
14      14    12
15      10    12
16      11    12
```

14. Write a R program to replace NA values with 3 in a given data frame.

PROGRAM:

```
        # create an example data frame df <- data.frame(x = c(1, 2, NA, 4, 5), y
= c("a", NA, "c", "d", NA))

# replace all NA values with 3 df[is.na(df)] <- 3

# print the updated data frame
Df
```

15. Write a R program to change a column name of a given data frame.

PROGRAM:

```
# create an example data frame df <- data.frame(x = c(1,
2, 3), y = c("a", "b", "c"))

# print the original data frame df

# change the column name colnames(df)[1] <-
"new_name"
```

```
# print the updated data frame
Df
```

OUTPUT:

```
[1] &quot;Original dataframe:&quot; name
score attempts qualify
1 Anastasia 12.5 1 yes 2
Dima 9.0 NA no
3  Katherine 16.5 2 yes

4  James 12.0 NA no
5  Emily 9.0 2 no
6  Michael 20.0 NA yes
7  Matthew 14.5 1 yes
8  Laura 13.5 NA no
9  Kevin 8.0 2 no
10 Jonas 19.0 1 yes
[1] &quot;Change column-name &#39;name&#39; to &#39;student_name&#39; of
the said dataframe:&quot; student_name score attempts qualify
1  Anastasia 12.5 1 yes
2  Dima 9.0 NA no
3  Katherine 16.5 2 yes
4  James 12.0 NA no
5  Emily 9.0 2 no
6  Michael 20.0 NA yes
7  Matthew 14.5 1 yes
8  Laura 13.5 NA no
9  Kevin 8.0 2 no
10 Jonas 19.0 1 yes
```

16. Write a R program to change more than one column name of a given data frame.

PROGRAM:

```
# create an example data frame df <- data.frame(name = c("Anastasia", "Dima",
"Katherine", "James",
"Emily", "Michael", "Matthew", "Laura", "Kevin", "Jonas"),                score = c(12.5,
9.0, 16.5, 12.0, 9.0, 20.0, 14.5, 13.5, 8.0, 19.0),                attempts = c(1, NA, 2, NA, 2,
NA, 1, NA, 2, 1),                qualify = c("yes", "no", "yes", "no", "no", "yes", "yes", "no",
"no", "yes"))

# print the original data frame cat("Original
dataframe:\n") print(df)

# change the column names names(df)[1:2] <-
c("student_name", "avg_score")
```

# print the updated data frame cat("\nChange more than one column name of the said dataframe:\n") print(df)

OUTPUT:

```
> # create an example data frame
> df <- data.frame(name = c("Anastasia", "Dima", "Katherine", "James",
"E ly", "Michael", "Matthew", "Laura", "Kevin", "Jonas"),
+                   score = c(12.5, 9.0, 16.5, 12.0, 9.0, 20.0, 14.5,
13.5
8.0, 19.0),
+                   attempts = c(1, NA, 2, NA, 2, NA, 1, NA, 2, 1),
+                   qualify = c("yes", "no", "yes", "no", "no", "yes",
"ye
, "no", "no", "yes"))
>
> # print the original data frame >
cat("Original dataframe:\n")
Original dataframe: >
print(df)
        name score attempts qualify 1
Anastasia  12.5        1     yes
2        Dima    9.0        NA       no
3        Katherine  16.5         2      yes
4        James   12.0        NA       no
5        Emily    9.0         2       no
6        Michael  20.0        NA       yes
7        Matthew  14.5         1       yes
8        Laura   13.5        NA       no
9        Kevin    8.0         2       no
10       Jonas   19.0         1      yes
>
> # change the column names
> names(df)[1:2] <- c("student_name", "avg_score")
>
> # print the updated data frame
> cat("\nChange more than one column name of the said dataframe:\n")

Change more than one column name of the said dataframe:
> print(df)
   student_name avg_score attempts qualify 1
Anastasia      12.5        1      yes
2           Dima        9.0        NA       no
3           Katherine       16.5         2      yes
4           James       12.0        NA       no
5           Emily        9.0         2       no
6           Michael       20.0        NA       yes
7           Matthew       14.5         1       yes
8           Laura       13.5        NA       no
9           Kevin        8.0         2       no
10          Jonas       19.0         1      yes
 >
>
```

17. Write a R program to select some random rows from a given data frame.

PROGRAM:

# create an example data frame df <- data.frame(name = c("Anastasia", "Dima", "Katherine", "James", "Emily", "Michael", "Matthew", "Laura", "Kevin", "Jonas"),   score = c(12.5, 9.0, 16.5, 12.0, 9.0, 20.0, 14.5, 13.5, 8.0, 19.0),   attempts = c(1, 3, 2, 3, 2, 3, 1, 1, 2, 1),   qualify = c("yes", "no", "yes", "no", "no", "yes", "yes", "no", "no", "yes"))

# print the original data frame cat("Original dataframe:\n") print(df)

# select random rows set.seed(123) # set the seed for reproducibility random_rows <- sample(nrow(df), 3)

# print the selected rows cat("\nSelect three random rows of the said dataframe:\n") print(df[random_rows,])

OUTPUT:

```
> # create an example data frame
> df <- data.frame(name = c("Anastasia", "Dima", "Katherine", "James", "
Emily", "Michael", "Matthew", "Laura", "Kevin", "Jonas"),
+                 score = c(12.5, 9.0, 16.5, 12.0, 9.0, 20.0, 14.5, 13.
5, 8.0, 19.0),
+                 attempts = c(1, 3, 2, 3, 2, 3, 1, 1, 2, 1), +
qualify = c("yes", "no", "yes", "no", "no", "yes", "y es", "no", "no",
"yes"))
>
> # print the original data frame >
cat("Original dataframe:\n")
Original dataframe: >
print(df)
        name score attempts qualify 1
Anastasia  12.5        1      yes
2       Dima   9.0        3      no
3       Katherine  16.5        2      yes
4       James  12.0        3      no
5       Emily   9.0        2      no
6       Michael  20.0        3      yes
7       Matthew  14.5        1      yes
8       Laura  13.5        1      no
9       Kevin   8.0        2      no
10      Jonas  19.0        1     yes
>
> # select random rows
> set.seed(123) # set the seed for reproducibility
> random_rows <- sample(nrow(df), 3)
>
> # print the selected rows
> cat("\nSelect three random rows of the said dataframe:\n")

Select three random rows of the said dataframe:
> print(df[random_rows,])
name score attempts qualify 3
Katherine  16.5        2      yes
```

```
10      Jonas  19.0         1      yes
2        Dima   9.0         3       no
> # create an example data frame
> df <- data.frame(name = c("Anastasia", "Dima", "Katherine", "James", "
Emily", "Michael", "Matthew", "Laura", "Kevin", "Jonas"),
+                  score = c(12.5, 9.0, 16.5, 12.0, 9.0, 20.0, 14.5, 13.
5, 8.0, 19.0),
+                  attempts = c(1, 3, 2, 3, 2, 3, 1, 1, 2, 1), +
qualify = c("yes", "no", "yes", "no", "no", "yes", "y es", "no", "no",
"yes"))
>
> # print the original data frame >
cat("Original dataframe:\n")
Original dataframe: >
print(df)
        name score attempts qualify 1
Anastasia  12.5        1     yes
2       Dima   9.0        3       no
3       Katherine  16.5        2      yes
4       James  12.0        3       no
5       Emily   9.0        2       no
6       Michael  20.0        3      yes
7       Matthew  14.5        1      yes
8       Laura  13.5        1       no
9       Kevin   8.0        2       no
10      Jonas  19.0        1      yes
>
> # select random rows
> set.seed(123) # set the seed for reproducibility
> random_rows <- sample(nrow(df), 3)
>
> # print the selected rows
> cat("\nSelect three random rows of the said dataframe:\n")

Select three random rows of the said dataframe:
> print(df[random_rows,])
name score attempts qualify 3
Katherine  16.5        2      yes
10      Jonas  19.0        1      yes
2        Dima   9.0        3       no
```

18. Write a R program to reorder an given data frame by column name.

PROGRAM:

\

```
# Create a sample data frame df <- data.frame(name = c("Anastasia", "Dima",
"Katherine", "James", "Emily",
"Michael", "Matthew", "Laura", "Kevin", "Jonas"),               score = c(12.5, 9.0, 16.5,
12.0, 9.0, 20.0, 14.5, 13.5, 8.0, 19.0),              attempts = c(1, 3, 2, 3, 2, 3, 1, 1, 2, 1),
qualify = c("yes", "no", "yes", "no", "no", "yes", "yes", "no", "no", "yes"))

# Print the original data frame
cat("Original dataframe:\n") print(df)
```

# Reorder the data frame by column name
cat("Reorder by column name:\n") df <- df[, c("name",
"attempts", "score", "qualify")] print(df)

OUTPUT:

```
> # Create a sample data frame
> df <- data.frame(name = c("Anastasia", "Dima", "Katherine", "James", "
Emily", "Michael", "Matthew", "Laura", "Kevin", "Jonas"),
+                  score = c(12.5, 9.0, 16.5, 12.0, 9.0, 20.0, 14.5, 13.
5, 8.0, 19.0),
+                  attempts = c(1, 3, 2, 3, 2, 3, 1, 1, 2, 1), +
qualify = c("yes", "no", "yes", "no", "no", "yes", "y es", "no", "no",
"yes"))
>
> # Print the original data frame >
cat("Original dataframe:\n")
Original dataframe: >
print(df)
        name score attempts qualify 1
Anastasia  12.5        1     yes
2       Dima    9.0        3       no
3       Katherine  16.5        2       yes
4       James  12.0        3       no
5       Emily   9.0        2       no
6       Michael  20.0        3       yes
7       Matthew  14.5        1       yes
8       Laura  13.5        1       no
9       Kevin   8.0        2       no
10      Jonas  19.0        1     yes
>
> # Reorder the data frame by column name >
cat("Reorder by column name:\n")
Reorder by column name:
> df <- df[, c("name", "attempts", "score", "qualify")]
> print(df)
        name attempts score qualify 1
Anastasia        1  12.5     yes
2       Dima        3   9.0      no
3       Katherine        2  16.5      yes
4       James        3  12.0      no
5       Emily        2   9.0      no
6       Michael        3  20.0      yes
7       Matthew        1  14.5      yes
8       Laura        1  13.5      no
9       Kevin        2   8.0      no
10      Jonas        1  19.0     yes
```

19. Write a R program to compare two data frames to find the elements in first data frame that are not present in second data frame.

PROGRAM:

```
# Create two data frames
df1 <- data.frame(a = c(1, 2, 3, 4, 5), b = c("A", "B", "C", "D", "E"))
df2 <- data.frame(a = c(2, 3, 6), b = c("B", "C", "F"))

# Find elements in df1 not present in df2
```

```
df1_not_in_df2 <- df1[!(paste(df1$a, df1$b) %in% paste(df2$a, df2$b)), ]

# Print the original data frames and the result
cat("df1:\n") print(df1) cat("\ndf2:\n")
print(df2)
cat("\nElements in df1 not present in df2:\n") print(df1_not_in_df2)
```

OUTPUT

```
> # Create two data frames
> df1 <- data.frame(a = c(1, 2, 3, 4, 5), b = c("A", "B", "C", "D", "E")
)
> df2 <- data.frame(a = c(2, 3, 6), b = c("B", "C", "F"))
>
> # Find elements in df1 not present in df2
> df1_not_in_df2 <- df1[!(paste(df1$a, df1$b) %in% paste(df2$a, df2$b)),
]
>
> # Print the original data frames and the result
> cat("df1:\n")
df1: >
print(df1)    a
b 1 1 A
2 2 B
3 3 C
4 4 D
5 5 E
> cat("\ndf2:\n")

df2:
> print(df2)
a b 1 2 B
2 3 C
3 6 F
> cat("\nElements in df1 not present in df2:\n")

Elements in df1 not present in df2:
> print(df1_not_in_df2)
a b 1 1 A
4 4 D
5 5 E
```

20. Write a R program to find elements which are present in two given dat a frames.

PROGRAM:

# create two data frames df1 <- data.frame(a=c(1,2,3), b=c(4,5,6), c=c(7,8,9), d=c(10,11,12), e=c(13,14,15)) df2 <- data.frame(d=c(10,11,12), e=c(13,14,15), f=c(16,17,18), g=c(19,20,21))

# display original data frames
cat("Original Dataframes\n")
print(df1) print(df2)

# find elements present in both data frames common_elements <- intersect(names(df1), names(df2))

# display common elements cat("\nElements which are present in both dataframe:\n") print(common_elements)

OUTPUT:

```
> # create two data frames
> df1 <- data.frame(a=c(1,2,3), b=c(4,5,6), c=c(7,8,9), d=c(10,11,12), e
=c(13,14,15))
> df2 <- data.frame(d=c(10,11,12), e=c(13,14,15), f=c(16,17,18), g=c(19,
20,21))
>
> # display original data frames
> cat("Original Dataframes\n")
Original Dataframes
> print(df1)    a b
c  d  e 1 1 4 7 10
13
2 2 5 8 11 14
3 3 6 9 12 15 > print(df2)    d  e  f  g 1
  10 13 16 19
2 11 14 17 20
3 12 15 18 21
>
> # find elements present in both data frames
> common_elements <- intersect(names(df1), names(df2))
>
> # display common elements
> cat("\nElements which are present in both dataframe:\n")

Elements which are present in both dataframe:
> print(common_elements) [1]
"d" "e"
```

21. Write a R program to find elements come only once that are common to both given data frames.

PROGRAM:

# create two data frames df1 <- data.frame(a = 1:5, b = 6:10, c = 11:15, d = 16:20, e = 21:25) df2 <- data.frame(d = 16:18, e = 21:23, f = 26:28, g = 29:31)

# combine data frames combined <- c(df1, df2)

# count frequency of each element freq <- table(unlist(combined))

# subset elements that appear exactly once result <-
names(freq[freq == 1])

# print the result cat("Original Dataframes\n") print(df1) print(df2) cat("Find elements come only once that are common to both given dataframes:\n") print(result)

OUTPUT:

```
> # create two data frames
> df1 <- data.frame(a = 1:5, b = 6:10, c = 11:15, d = 16:20, e = 21:25)
> df2 <- data.frame(d = 16:18, e = 21:23, f = 26:28, g = 29:31)
>
> # combine data frames
> combined <- c(df1, df2)
>
> # count frequency of each element
> freq <- table(unlist(combined))
>
> # subset elements that appear exactly once
> result <- names(freq[freq == 1])
>
> # print the result
> cat("Original Dataframes\n")
Original Dataframes
> print(df1)    a  b
c  d  e 1 1  6 11 16
21
2 2  7 12 17 22
3 3  8 13 18 23
4 4  9 14 19 24
5 5 10 15 20 25 > print(df2)    d  e  f  g 1 16 21 26 29
2 17 22 27 30
3 18 23 28 31
> cat("Find elements come only once that are common to both given datafr
ames:\n")
Find elements come only once that are common to both given dataframes:
> print(result)
 [1] "1"  "2"  "3"  "4"  "5"  "6"  "7"  "8"  "9"  "10" "11" "12" "13" [14]
"14" "15" "19" "20" "24" "25" "26" "27" "28" "29" "30" "31"
```

22. Write a R program to save the information of a data frame in a file and display the information of the file.

PROGRAM:

# Create a sample data frame df <- data.frame(name = c("Anastasia", "Dima", "Katherine", "James", "Emily", "Michael",
"Matthew", "Laura", "Kevin", "Jonas"),   score = c(12.5, 9.0, 16.5, 12.0, 9.0, 20.0, 14.5, 13.5, 8.0, 19.0),   attempts = c(1, 3, 2, 3, 2, 3, 1, 1, 2, 1),   qualify = c("yes", "no", "yes", "no", "no", "yes", "yes", "no", "no", "yes")
)

```
# Save the data frame to a file save(df, file =
"data.rda")

# Display information about the file cat("File
info:\n") print(file.info("data.rda"))
```

OUTPUT:

```
[1] &quot;Original dataframe:&quot;
name score attempts qualify
1  Anastasia 12.5 1 yes
2  Dima 9.0 3 no
3  Katherine 16.5 2 yes
4  James 12.0 3 no
5  Emily 9.0 2 no
6  Michael 20.0 3 yes
7  Matthew 14.5 1 yes
8  Laura 13.5 1 no
9  Kevin 8.0 2 no 10 Jonas 19.0 1 yes size isdir mode mtimectime

data.rda 344 FALSE 644 2018-10-25 12:06:09 2018-10-25 12:06:09
atimeuidgidunamegrname data.rda 2018-10-25 12:06:09 1000 1000 trinket
trinket
```

23. Write a R program to count the number of NA values in a data frame column.

PROGRAM:

```
# create a sample dataframe df <- data.frame(   name = c("Anastasia", "Dima",
"Katherine", "James", "Emily",           "Michael", "Matthew", "Laura", "Kevin",
"Jonas"),   score = c(12.5, 9.0, 16.5, 12.0, 9.0, 20.0, 14.5, 13.5, 8.0, 19.0),   attempts =
c(1, NA, 2, NA, 2, NA, 1, NA, 2, 1),   qualify = c("yes", "no", "yes", "no", "no", "yes",
"yes", "no", "no", "yes")
)

# print the original dataframe cat("Original
dataframe:\n") print(df)

# count the number of NA values in attempts column cat("The number
of NA values in attempts column:\n") sum(is.na(df$attempts))
```

OUTPUT:

```
> # create a sample dataframe
> df <- data.frame(
+     name = c("Anastasia", "Dima", "Katherine", "James", "Emily",
+              "Michael", "Matthew", "Laura", "Kevin", "Jonas"),
+     score = c(12.5, 9.0, 16.5, 12.0, 9.0, 20.0, 14.5, 13.5, 8.0, 19.0)
,
+     attempts = c(1, NA, 2, NA, 2, NA, 1, NA, 2, 1),
+     qualify = c("yes", "no", "yes", "no", "no", "yes", "yes", "no", "n
o", "yes")
+ )
>
> # print the original dataframe >
cat("Original dataframe:\n")
Original dataframe: >
print(df)
        name score attempts qualify 1
Anastasia  12.5        1     yes
2       Dima    9.0        NA       no
3       Katherine  16.5        2      yes
4       James  12.0        NA       no
5       Emily    9.0        2       no
6       Michael  20.0        NA      yes
7       Matthew  14.5         1      yes
8       Laura  13.5        NA       no
9       Kevin    8.0        2       no
10      Jonas  19.0        1      yes
>
> # count the number of NA values in attempts column
> cat("The number of NA values in attempts column:\n")
The number of NA values in attempts column:
> sum(is.na(df$attempts)) [1]
4
```

24. Write a R program to create a data frame using two given vectors and display the duplicated elements and unique rows of the said data frame.

PROGRAM:

```
# create two vectors vec1 <- c(10, 20, 10, 10,
40, 50, 20, 30) vec2 <- c(10, 30, 10, 20, 0, 50,
30, 30)

# create data frame using the two vectors df <-
data.frame(a = vec1, b = vec2)

# print original data frame cat("Original
data frame:\n") print(df)

# find duplicated elements in data frame
```

cat("Duplicate elements of the said data frame:\n") duplicated_rows <- duplicated(df) | duplicated(df, fromLast = TRUE) print(duplicated_rows)

# find unique rows in data frame cat("Unique rows of the said data frame:\n") unique_rows <- df[!duplicated_rows,] print(unique_rows)

OUTPUT:

```
> # create two vectors
> vec1 <- c(10, 20, 10, 10, 40, 50, 20, 30)
> vec2 <- c(10, 30, 10, 20, 0, 50, 30, 30)
>
> # create data frame using the two vectors
> df <- data.frame(a = vec1, b = vec2)
>
> # print original data frame
> cat("Original data frame:\n")
Original data frame:
> print(df)     a  b
1 10 10
2 20 30
3 10 10
4 10 20
5 40  0
6 50 50
7 20 30
8 30 30
>
> # find duplicated elements in data frame
> cat("Duplicate elements of the said data frame:\n")
Duplicate elements of the said data frame:
> duplicated_rows <- duplicated(df) | duplicated(df, fromLast = TRUE)
> print(duplicated_rows)
[1]  TRUE  TRUE  TRUE FALSE FALSE FALSE  TRUE FALSE
>
> # find unique rows in data frame
> cat("Unique rows of the said data frame:\n")
Unique rows of the said data frame:
> unique_rows <- df[!duplicated_rows, ]
> print(unique_rows)
a  b 4 10 20
5 40  0
6 50 50
8 30 30
```

25. Write a R program to call the (built-in) dataset airquality. Check whether it is a data frame or not? Order the entire data frame by the first and second column.

PROGRAM:

# Load the airquality dataset data("airquality")

# Check whether it is a data frame or not

cat("Original data: Daily air quality measurements in New York, May to September 1973.\n")
if (is.data.frame(airquality)) {   cat("data.frame\n")
}

# Order the entire data frame by the first and second column cat("\nOrder the entire data frame by the first and second column:\n") airquality <- airquality[order(airquality$Ozone, airquality$Solar.R),] print(head(airquality))

OUTPUT:

```
> # Load the airquality dataset
> data("airquality")
>
> # Check whether it is a data frame or not
> cat("Original data: Daily air quality measurements in New York, May to
September 1973.\n")
Original data: Daily air quality measurements in New York, May to Septem
ber 1973.
> if (is.data.frame(airquality)) {
+     cat("data.frame\n")
+ } data.frame
>
> # Order the entire data frame by the first and second column
> cat("\nOrder the entire data frame by the first and second column:\n")

Order the entire data frame by the first and second column:
> airquality <- airquality[order(airquality$Ozone, airquality$Solar.R),
]
> print(head(airquality))
    Ozone Solar.R Wind Temp Month Day
21      1       8  9.7   59     5  21
23      4      25  9.7   61     5  23
18      6      78 18.4   57     5  18
76      7      48 14.3   80     7  15
147     7      49 10.3   69     9  24
11      7      NA  6.9   74     5  11
```

26. Write a R program to call the (built-in) dataset airquality. Remove the variables &#39;Solar.R&#39; and &#39;Wind&#39; and display the data frame.

PROGRAM:

# Load the airquality dataset data(airquality)

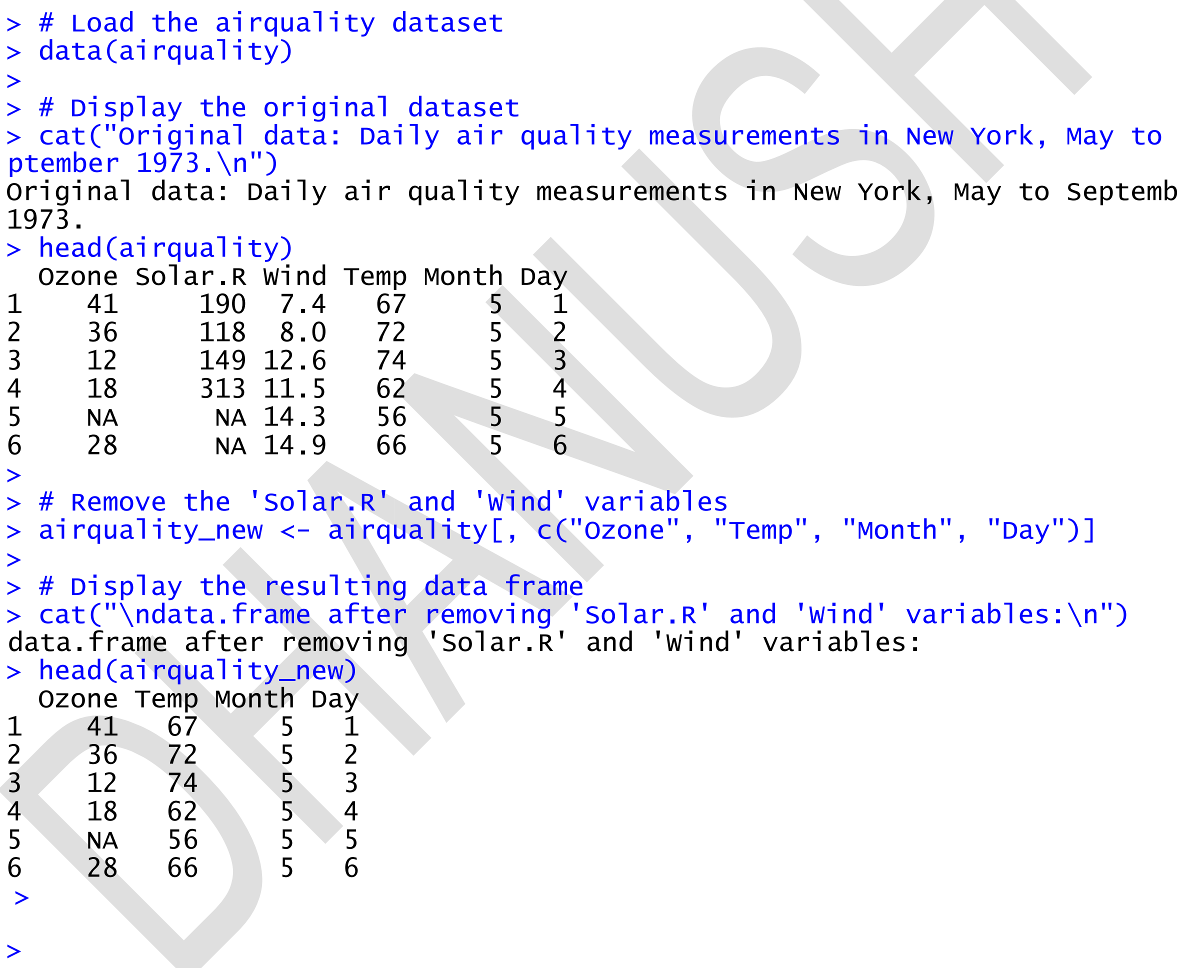
# Display the original dataset

cat("Original data: Daily air quality measurements in New York, May to
September 1973.\n") head(airquality)

# Remove the 'Solar.R' and 'Wind' variables airquality_new <- airquality[,
c("Ozone", "Temp", "Month", "Day")]

# Display the resulting data frame cat("\ndata.frame after removing
'Solar.R' and 'Wind' variables:\n") head(airquality_new)

OUTPUT:



```
> # Load the airquality dataset
> data(airquality)
>
> # Display the original dataset
> cat("Original data: Daily air quality measurements in New York, May to
ptember 1973.\n")
Original data: Daily air quality measurements in New York, May to Septemb
1973.
> head(airquality)
  Ozone Solar.R Wind Temp Month Day
1    41     190  7.4   67     5   1
2    36     118  8.0   72     5   2
3    12     149 12.6   74     5   3
4    18     313 11.5   62     5   4
5    NA      NA 14.3   56     5   5
6    28      NA 14.9   66     5   6
>
> # Remove the 'Solar.R' and 'Wind' variables
> airquality_new <- airquality[, c("Ozone", "Temp", "Month", "Day")]
>
> # Display the resulting data frame
> cat("\ndata.frame after removing 'Solar.R' and 'Wind' variables:\n")
data.frame after removing 'Solar.R' and 'Wind' variables:
> head(airquality_new)
  Ozone Temp Month Day
1    41   67     5   1
2    36   72     5   2
3    12   74     5   3
4    18   62     5   4
5    NA   56     5   5
6    28   66     5   6
 >

>
```

27. Find the difference between Data Frames and other Data Structures with example.

Solution:

Data Structure:

There is also an array data structure that extends this idea to more than two dimensions. A collection of vectors that all have the same length. This is like a matrix, except that each column can contain a different data type.
Eg:Array, Linked Lists, Stack, Queues, Trees, Graphs, Sets, Hash Tables.

Data Frame:

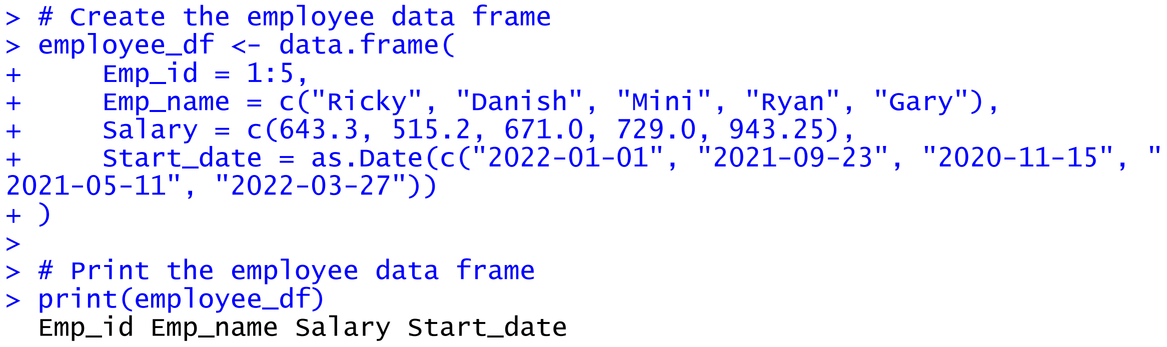
A data frame can be used to represent an entire data set. A data frame is a table or a two-dimensional array-like structure in which each column contains values of one variable and each row contains one set of values from each column.
Eg: Matrices

28. How to create the data frame and print it for the employee data set.

PROGRAM:

```
# Create the employee data frame employee_df
<- data.frame(
 Emp_id = 1:5,
 Emp_name = c("Ricky", "Danish", "Mini", "Ryan", "Gary"),
 Salary = c(643.3, 515.2, 671.0, 729.0, 943.25),
 Start_date = as.Date(c("2022-01-01", "2021-09-23", "2020-11-15",
"2021-05-11", "2022-03-27"))
)

# Print the employee data frame print(employee_df)
```

OUTPUT:



```
> # Create the employee data frame
> employee_df <- data.frame(
+     Emp_id = 1:5,
+     Emp_name = c("Ricky", "Danish", "Mini", "Ryan", "Gary"),
+     Salary = c(643.3, 515.2, 671.0, 729.0, 943.25),
+     Start_date = as.Date(c("2022-01-01", "2021-09-23", "2020-11-15", "
2021-05-11", "2022-03-27"))
+ )
> 
> # Print the employee data frame
> print(employee_df)
  Emp_id Emp_name Salary Start_date
```

```
1      1    Ricky 643.30 2022-01-01
2      2   Danish 515.20 2021-09-23
3      3     Mini 671.00 2020-11-15
4      4     Ryan 729.00 2021-05-11
5      5     Gary 943.25 2022-03-27
```

29. Write the code to get the Structure of the R Data Frame.

PROGRAM:

```
# Create a sample data frame df
<- data.frame(
A = c(1, 2, 3),
B = c("foo", "bar", "baz"),
C = c(TRUE, FALSE, TRUE)
)

# Get the structure of the data frame str(df)
```

OUTPUT:

```
> # Create a sample data frame
> df <- data.frame(
+     A = c(1, 2, 3),
+     B = c("foo", "bar", "baz"),
+     C = c(TRUE, FALSE, TRUE)
+ )
>
> # Get the structure of the data frame
> str(df)
'data.frame':	3 obs. of  3 variables:
 $ A: num  1 2 3
 $ B: chr  "foo" "bar" "baz"  $
C: logi  TRUE FALSE TRUE
```

30. How to extract data from data frame for the above employee dataset.

PROGRAM:

```
# Create the employee data frame employee_df
<- data.frame(
 Emp_id = 1:5,
 Emp_name = c("Ricky", "Danish", "Mini", "Ryan", "Gary"),
  Salary = c(643.3, 515.2, 671.0, 729.0, 943.25),
  Start_date = as.Date(c("2022-01-01", "2021-09-23", "2020-11-15",
"2021-05-11", "2022-03-27"))
)

# Extract the Emp_name and Salary columns
emp_data <- data.frame(   emp_name =
employee_df$Emp_name,   salary =
employee_df$Salary
)

# Display the extracted data
print(emp_data)
```

OUTPUT:

```
> # Create the employee data frame
> employee_df <- data.frame(
+     Emp_id = 1:5,
+     Emp_name = c("Ricky", "Danish", "Mini", "Ryan", "Gary"),
+     Salary = c(643.3, 515.2, 671.0, 729.0, 943.25),
+     Start_date = as.Date(c("2022-01-01", "2021-09-23", "2020-11-15", "
2021-05-11", "2022-03-27"))
+ )
>
> # Extract the Emp_name and Salary columns
> emp_data <- data.frame(
+     emp_name = employee_df$Emp_name,
+     salary = employee_df$Salary
+ )
>
> # Display the extracted data
> print(emp_data)
emp_name salary 1
Ricky 643.30
2     Danish 515.20
3     Mini 671.00
4     Ryan 729.00
5     Gary 943.25
```

31. How to extract the first two rows and then all columns in employee data frame.

PROGRAM:

```
# Create the employee data frame employee_df
<- data.frame(
  Emp_id = 1:5,
  Emp_name = c("Ricky", "Danish", "Mini", "Ryan", "Gary"),
  Salary = c(643.3, 515.2, 671.0, 729.0, 943.25),
  Start_date = as.Date(c("2022-01-01", "2021-09-23", "2020-11-15",
"2021-05-11", "2022-03-27"))
)

# Extract the first two rows and all columns emp_data
<- employee_df[1:2, ]

# Display the extracted data print(emp_data)
```

OUTPUT:

```
> # Create the employee data frame
> employee_df <- data.frame(
+     Emp_id = 1:5,
+     Emp_name = c("Ricky", "Danish", "Mini", "Ryan", "Gary"),
+     Salary = c(643.3, 515.2, 671.0, 729.0, 943.25),
+     Start_date = as.Date(c("2022-01-01", "2021-09-23", "2020-11-15", "20
21-05-11", "2022-03-27"))
+ )
>
> # Extract the first two rows and all columns
> emp_data <- employee_df[1:2, ]
>
> # Display the extracted data
> print(emp_data)
  Emp_id Emp_name Salary Start_date
1      1    Ricky  643.3 2022-01-01
2      2   Danish  515.2 2021-09-23
```

32. Write a code to extract 3 rd and 5 th row with 2 nd and 4 th column of the employee data.

PROGRAM:

```
# Create the employee data frame employee_df <-
data.frame(
  Emp_id = 1:5,
  Emp_name = c("Ricky", "Danish", "Mini", "Ryan", "Gary"),
  Salary = c(643.3, 515.2, 671.0, 729.0, 943.25),
  Start_date = as.Date(c("2022-01-01", "2021-09-23", "2020-11-15",
"2021-05-11", "2022-03-27"))
```

)

# Extract the 3rd and 5th rows with the 2nd and 4th columns emp_data <- employee_df[c(3, 5), c(2, 4)]

# Display the extracted data print(emp_data)

OUTPUT:

```
> # Create the employee data frame
> employee_df <- data.frame(
+     Emp_id = 1:5,
+     Emp_name = c("Ricky", "Danish", "Mini", "Ryan", "Gary"),
+     Salary = c(643.3, 515.2, 671.0, 729.0, 943.25),
+     Start_date = as.Date(c("2022-01-01", "2021-09-23", "2020-11-15", "20
21-05-11", "2022-03-27"))
+ )
> 
> # Extract the 3rd and 5th rows with the 2nd and 4th columns
> emp_data <- employee_df[c(3, 5), c(2, 4)]
> 
> # Display the extracted data
> print(emp_data)
  Emp_name Start_date
3     Mini 2020-11-15
5     Gary 2022-03-27
```

33. How to expand the data frame by adding rows and columns in data frame for employee data set. Add Column: dept&lt;-c(&quot;IT&quot;,&quot;Operations&quot;,&quot;IT&quot;,&quot;HR&quot;,&quot;Finance&quot;)

PROGRAM:

```
# create the first data frame
> df1 <- data.frame(
+   ID = c(1, 2, 3, 4, 5),
+   Name = c("John", "Sara", "David", "Sarah", "Mike")
+ )
> # create the second data frame
> df2 <- data.frame(
+   ID = c(2, 4),
+   Name = c("Sara", "Sarah")
+ )
> # compare the two data frames and find rows in df1 that
are not in df2 > df1_not_in_df2 <- anti_join(df1, df2, by =
c("ID", "Name")) Error in anti_join(df1, df2, by = c("ID",
"Name")) :     could not find function "anti_join"
> # print the result
> df1_not_in_df2
```

```
Error: object 'df1_not_in_df2' not found
```

34. Write a R program to compare two data frames to find the row(s) in first data frame that

are not present in second data frame.

CODE:

```
# create the first data frame
> df1 <- data.frame(
+   ID = c(1, 2, 3, 4, 5),
+   Name = c("John", "Sara", "David", "Sarah", "Mike")
+ )
> # create the second data frame
> df2 <- data.frame(
+   ID = c(2, 4),
+   Name = c("Sara", "Sarah")
+ )
> # compare the two data frames and find rows in df1 that are not in df2
> df1_not_in_df2 <- anti_join(df1, df2, by = c("ID", "Name"))
Error in anti_join(df1, df2, by = c("ID", "Name")) :
  could not find function "anti_join"
> # print the result
> df1_not_in_df2
Error: object 'df1_not_in_df2' not found
```

35. Write a R program to find elements come only once that are common to both given data

frames.

CODE:

```
> # create two example data frames
> df1 <- data.frame(A = c(1, 2, 3, 4, 5),
+                   B = c("apple", "banana", "cherry", "banana", "apple"))
> df2 <- data.frame(A = c(2, 4, 6),
+                   B = c("banana", "apple", "orange"))
> # find elements that occur only once and are common to both data frames
> common <- intersect(df1$B, df2$B)
> result <- unique(df1$B[duplicated(df1$B) & df1$B %in% common])
> # print the result
> print(result)
[1] "banana" "apple"
```

36. Write a R program to create a data frame using two given vectors and display the duplicated elements and unique rows of the said data frame.

Practice Probs

File Read and Write Functions in R

```
Readline()
con &lt;- file(&quot;Sample.txt&quot;, &quot;r&quot;)
w&lt;-readLines(con)
close(con)
w[1]
w[2]
w[3]
writeline()
sample&lt;-c(&quot;Class,Alcohol,Malic
acid,Ash&quot;,&quot;1,14.23,1.71,2.43&quot;,&quot;1,13.2,1.78,2.14&quot;)
writeLines(sample,&quot;sample.csv&quot;)
```

```
dput()  and dget():
# Create a data frame
x &lt;- data.frame(Name = &quot;Mr. A&quot;, Gender = &quot;Male&quot;, Age=35)
#Print &#39;dput&#39; output to your R console
dput(x)
#Write the &#39;dput&#39; output to a file
dput(x, file = &quot;w.R&quot;)
# Now read in &#39;dput&#39; output from the file
y &lt;- dget(&quot;w.R&quot;)
```

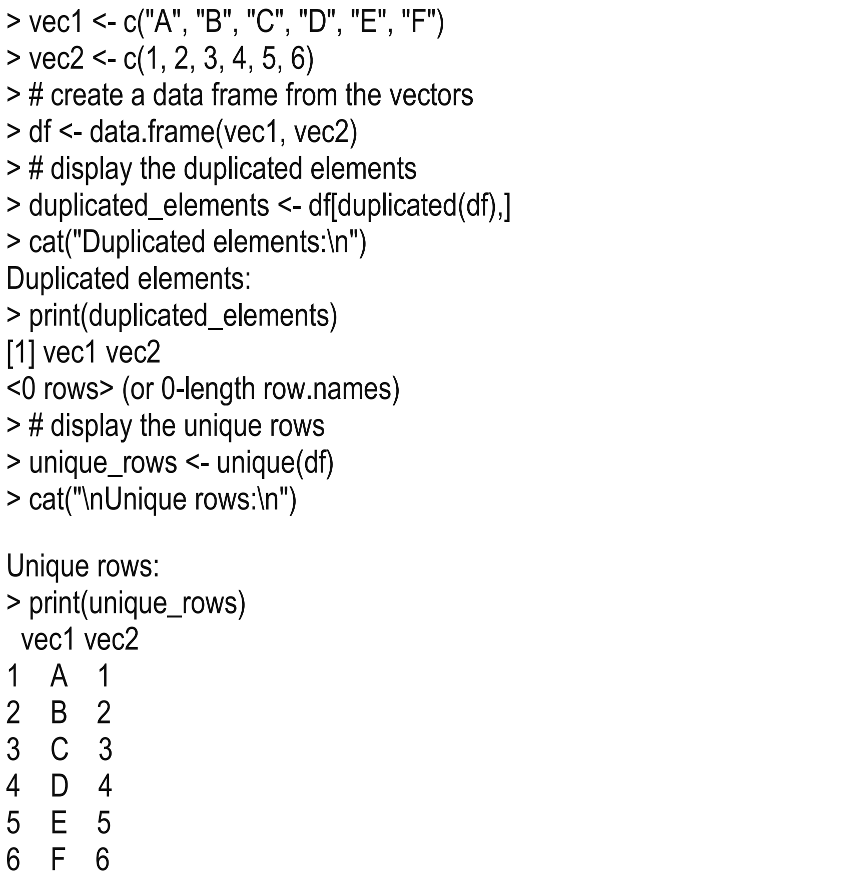
```
y

dump()

x&lt;-1:10

d &lt;- data.frame(Name = &quot;Mr. A&quot;, Gender = &quot;Male&quot;, Age=35)

dump(c(&quot;x&quot;, &quot;d&quot;), file = &quot;dump_data.R&quot;)

rm(x, d) #After dumping just remove the variables from environment.

source(&quot;dump_data.R&quot;)

x

d

str(d)
```

read &amp; Write

```
&gt; data &lt;- read.csv(&quot;employee_data.csv&quot;, header =
TRUE,sep=&quot;,&quot;)

&gt; is.data.frame(data)

[1] TRUE

&gt; ncol(data)

[1] 9

&gt; nrow(data)

[1] 1000

&gt; sal &lt;- max(data$salary)

&gt; sal

[1] 106905

&gt;retval &lt;-subset(data, gender==&quot;M&quot;)

&gt; write.csv(retval,&quot;output.csv&quot;)

&gt; dim(retval)

[1] 610 9
```

CODE:

```
# create two vectors
```



```
> vec1 <- c("A", "B", "C", "D", "E", "F")
> vec2 <- c(1, 2, 3, 4, 5, 6)
> # create a data frame from the vectors
> df <- data.frame(vec1, vec2)
> # display the duplicated elements
> duplicated_elements <- df[duplicated(df),]
> cat("Duplicated elements:\n")
Duplicated elements:
> print(duplicated_elements)
[1] vec1 vec2
<0 rows> (or 0-length row.names)
> # display the unique rows
> unique_rows <- unique(df)
> cat("\nUnique rows:\n")

Unique rows:
> print(unique_rows)
  vec1 vec2
1    A    1
2    B    2
3    C    3
4    D    4
5    E    5
6    F    6
```