ITA0448 Statistics with R Programming for Vectorized Expressions

DAY 3

ASSESSMENT 1

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
```

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

   rbind() function:
   Output:

```
            city                zipcode

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

```
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)
```

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
```

Source Code:

```
df1 <- data.frame(surname = c("Hitchcock", "Polanski", "Scorsese"),
           nationality = c("UK", "Poland", "US"))
df2 <- data.frame(surname = c("Hitchcock", "Hitchcock", "Polanski"),
           movies = c("Psycho", "North by Northwest", "Chinatown"))
merged_df <- merge(df1, df2)
dim(merged_df)
```

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
```

   Source Code:

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

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
```

Source Code:

```
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")
d<-data.frame(name,score,Attempts,Qualify)
d
```

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
```

Source Code:

```
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<-(data.frame(df$name,df$score))
result
```

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
```

Source Code:

```
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)
```

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
```

Source Code:

```
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(3,5),c(1,3)]
print(result)
```

8. 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
```

Source Code:

```
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')
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
```

9 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
```

Source Code:

```
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)

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)
```

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
```

Source Code:

```
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')
exam<-data.frame(name,score,attempts,qualify)
exam<-subset(exam,select = -c(name, qualify))
exam
```

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
10     Jonas  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
```

Source Code:

```
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')
exam<-data.frame(name,score,attempts,qualify)
exam<- exam[-c(2, 4, 6),]
exam
```

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
```

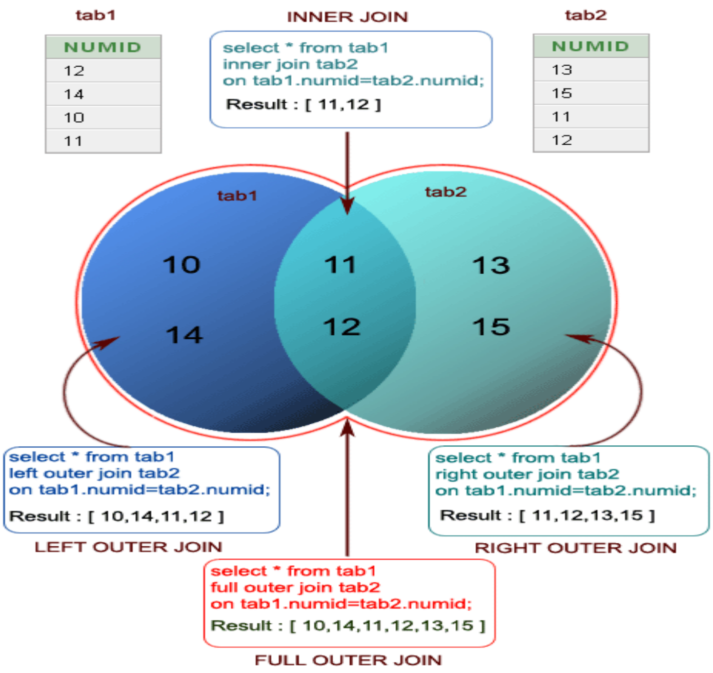
```
4      James  12.0        3      no
5      Emily   9.0        2      no
6    Michael  20.0        3     yes
7    Matthew  14.5        1     yes
8      Laura  13.5        1      no
9      Kevin   8.0        2      no
10     Jonas  19.0        1     yes
[1] "dataframe after sorting 'name' and 'score' 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
```

Source Code:

```
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')
exam<-data.frame(name,score,attempts,qualify)
print("dataframe after sorting 'name' and 'score' columns:")
exam<-exam[with(exam,order(name, score)), ]
print(exam)
```

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      11
```

```
10     14     11
11     10     11
12     11     11
13     12     12
14     14     12
15     10     12
16      11     12
```

Source Code:

```
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)
```

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

Output:

```
[1] "Original dataframe:"
        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] "After removing NA with 3, the said dataframe becomes:"
        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       3     no
9     Kevin   8.0       2     no
10    Jonas  19.0       1    yes
```

source code:

```
       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")
)
cat("Original dataframe:\n")
print(df)
df[is.na(df)] <- 3
cat("After removing NA with 3, the said dataframe becomes:\n")
print(df)
```

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

Output:

```
[1] "Original dataframe:"
        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] "Change column-name 'name' to 'student_name' of the said dataframe:"
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
```

source code :

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

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

Output:

```
[1] "Original dataframe:"
        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] "Change more than one column name  of the said dataframe:"
student_nameavg_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
```

source code :

```
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")
)
cat("Original dataframe:\n")
print(df)
colnames(df)[1] <- "student_name"
colnames(df)[2] <- "avg_score"
cat("\nChange more than one column name of the said dataframe:\n")
print(df)
```

17 Write a R program to select some random 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] "Select three random rows of the said dataframe:"
      name score attempts qualify
10   Jonas  19.0        1     yes
7  Matthew  14.5        1     yes
4    James  12.0        3      no
```

source code :

```
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)
cat("Original dataframe:\n")
print(df)
cat("\nSelect three random rows of the said dataframe:\n")
set.seed(123)
random_rows <- sample(nrow(df), 3, replace = FALSE)
```

18 Write a R program to reorder an given data frame by 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] "Reorder by column name:"
        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
```

source code

```
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")
)
cat("[1] \"Original dataframe:\"\n")
print(df)
cat("\n[1] \"Reorder by column name:\"\n")
df <- df[, c("name", "attempts", "score", "qualify")]
print(df)
```

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.

Output:

```
[1] "Original Dataframes"
[1] "a" "b" "c" "d" "e"
[1] "d" "e" "f" "g"
[1] "Data in first dataframe  that are not present in second dataframe:"
[1] "a" "b" "c"
```

source code:

```
df1 <- data.frame(x = c("a", "b", "c", "d", "e"))
```

```
df2 <- data.frame(x = c("d", "e", "f", "g"))
cat("Original Dataframes\n")
print(df1$x)
print(df2$x)
diff <- setdiff(df1$x, df2$x)
cat("Data in first dataframe that are not present in second dataframe:\n")
print(diff)
```

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

Output:

```
[1] "Original Dataframes"
[1] "a" "b" "c" "d" "e"
[1] "d" "e" "f" "g"
[1] "Elements which are present in both dataframe:"
[1] "d" "e"
```

source code:

```
df1 <- data.frame(x = c("a", "b", "c", "d", "e"))
df2 <- data.frame(x = c("d", "e", "f", "g"))
cat("Original Dataframes\n")
print(df1$x)
print(df2$x)
common <- intersect(df1$x, df2$x)
cat("Elements which are present in both data frames:\n")
print(common)
```

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

Output:

```
[1] "Original Dataframes"
[1] "a" "b" "c" "d" "e"
[1] "d" "e" "f" "g"
[1] "Find elements come only once that are common to both given dataframes:"
[1] "a" "b" "c" "d" "e" "f" "g"
```

source code:

```
df1 <- data.frame(x = c("a", "b", "c", "d", "e"))
df2 <- data.frame(x = c("d", "e", "f", "g"))
cat("Original Dataframes\n")
print(df1$x)
print(df2$x)
common <- intersect(df1$x, df2$x)
result <- unique(c(df1$x[df1$x %in% common], df2$x[df2$x %in% common]))
cat("Find elements come only once that are common to both given data frames:\n")
print(result)
```

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

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
         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
```

source code :

```
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)
save(df, file = "data.rda")
file.info("data.rda")
```

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

Output:

```
[1] "Original dataframe:"
        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] "The number of NA values in attempts column:"
[1] 4
```

source code:

```
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, NA, 2, NA, 1, NA, 2, 1),
           qualify = c("yes", "no", "yes", "no", "no", "yes", "yes", "no", "no", "yes"))
cat("Original dataframe:\n")
print(df)
cat("The number of NA values in attempts column:\n")
sum(is.na(df$attempts))
```

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.

Output:

```
[1] "Original data frame:"
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
[1] "Duplicate elements of the said data frame:"
[1] FALSE FALSE  TRUE FALSE FALSEFALSE  TRUE FALSE
[1] "Unique rows of the said data frame:"
a  b
1 10 10
2 20 30
4 10 20
5 40  0
6 50 50
8 30 30
source code:
vec1 <- c(10, 20, 10, 10, 40, 50, 20, 30)
vec2 <- c(10, 30, 10, 20, 0, 50, 30, 30)
df <- data.frame(a = vec1, b = vec2)
cat("Original data frame:\n")
print(df)

cat("Duplicate elements of the said data frame:\n")
print(duplicated(df))
cat("Unique rows of the said data frame:\n")
print(unique(df))
```

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.

Output:

```
[1] "Original data: Daily air quality measurements in New York, May to September 1973."
```

```
[1] "data.frame"
   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
7     23     299  8.6   65     5   7
8     19      99 13.8   59     5   8
9      8      19 20.1   61     5   9
10    NA     194  8.6   69     5  10
[1] "Order the entire data frame by the first and second column:"
    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
...........
119    NA     153  5.7   88     8  27
150    NA     145 13.2   77     9  27
```

source code

```
data("airquality")

cat("Original data:", attr(airquality, "descr"), "\n")
if (is.data.frame(airquality)) {
  cat("data.frame\n")
}

airquality_sorted <- airquality[order(airquality[,1], airquality[,2]),]
cat("Order the entire data frame by the first and second column:\n")
head(airquality_sorted)
```

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

Output:

```
[1] "Original data: Daily air quality measurements in New York, May to September 1973."
    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
.........
152    18     131  8.0   76     9  29
153    20     223 11.5   68     9  30
[1] "data.frame after removing 'Solar.R'  and 'Wind' variables:"
    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
.........
152    18   76    9  29
153    20   68    9  30
```

source code :

```
data("airquality")


airquality_new <- airquality[, c("Ozone", "Temp", "Month", "Day")]
cat("Original data: Daily air quality measurements in New York, May to September 1973.\n")
head(airquality)
cat("\ndata.frame after removing 'Solar.R'  and 'Wind' variables:\n")
head(airquality_new)
```

27)
How to create the data frame and print it for the employee data set.
Emp_id = 1:5
Emp_name =
&quot;Ricky&quot;,&quot;Danish&quot;,&quot;Mini&quot;,&quot;Ryan&quot;,&quot;Gary&quot;
Salary = 643.3,515.2,671.0,729.0,943.25
Start_date = &quot;2022-01-01&quot;, &quot;2021-09-23&quot;, &quot;2020-11-15&quot;,
&quot;2021-05-11&quot;,&quot;2022-03-
27&quot;

source code :

```
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 <- c("2022-01-01", "2021-09-23", "2020-11-15", "2021-05-11", "2022-03-27")
employee_df <- data.frame(Emp_id, Emp_name, Salary, Start_date)
print(employee_df)
```

29)
write the code to get the structure of the r dataframe
source code

```
df <- data.frame(
  id = 1:5,
  name = c("Alice", "Bob", "Charlie", "Dave", "Eve"),
  age = c(25, 30, 40, 35, 28),
  married = c(TRUE, FALSE, TRUE, TRUE, FALSE)
)

str(df)
```

30)

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

Expected Output:

```
emp.data.emp_name. emp.data.salary
1 Ricky 643.30
2 Danish 515.20
3 Mini 671.00
4 Ryan 729.00
    5    Gary 943.25
```

source code

```
emp.data[, c("emp_name", "salary")]
```