

Exp # 6 (Merge Data Frames)

1. Create the dataframes to merge:

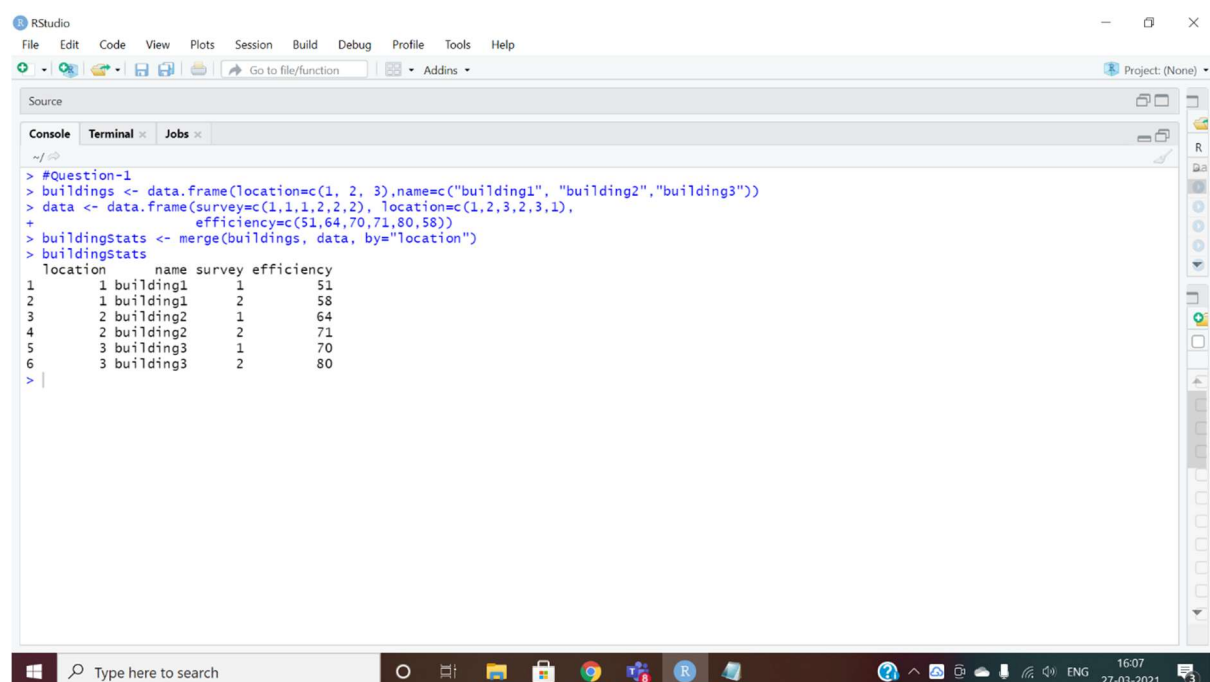
```
buildings <- data.frame(location=c(1, 2, 3), name=c("building1", "building2",  
"building3"))  
  
data <- data.frame(survey=c(1,1,1,2,2,2), location=c(1,2,3,2,3,1),  
efficiency=c(51,64,70,71,80,58))
```

The dataframes, buildings and data have a common key variable called, "location". Use the merge() function to merge the two dataframes by "location", into a new dataframe, "buildingStats".

Answer:

```
buildings <- data.frame(location=c(1, 2, 3),name=c("building1", "building2","building3"))  
data <- data.frame(survey=c(1,1,1,2,2,2), location=c(1,2,3,2,3,1),  
                  efficiency=c(51,64,70,71,80,58))  
  
buildingStats <- merge(buildings, data, by="location")  
  
buildingStats
```

OUTPUT



The screenshot shows the RStudio interface with the console output of the R code. The code creates two dataframes, 'buildings' and 'data', and then merges them into 'buildingStats' using the 'merge()' function. The output of 'buildingStats' is displayed as a table with 6 rows and 4 columns: 'location', 'name', 'survey', and 'efficiency'.

```
> #Question-1  
> buildings <- data.frame(location=c(1, 2, 3),name=c("building1", "building2","building3"))  
> data <- data.frame(survey=c(1,1,1,2,2,2), location=c(1,2,3,2,3,1),  
+                   efficiency=c(51,64,70,71,80,58))  
> buildingStats <- merge(buildings, data, by="location")  
> buildingStats  
  location name survey efficiency  
1      1 building1      1        51  
2      1 building1      2        58  
3      2 building2      1        64  
4      2 building2      2        71  
5      3 building3      1        70  
6      3 building3      2        80  
>
```

2 . Give the dataframes different key variable names:

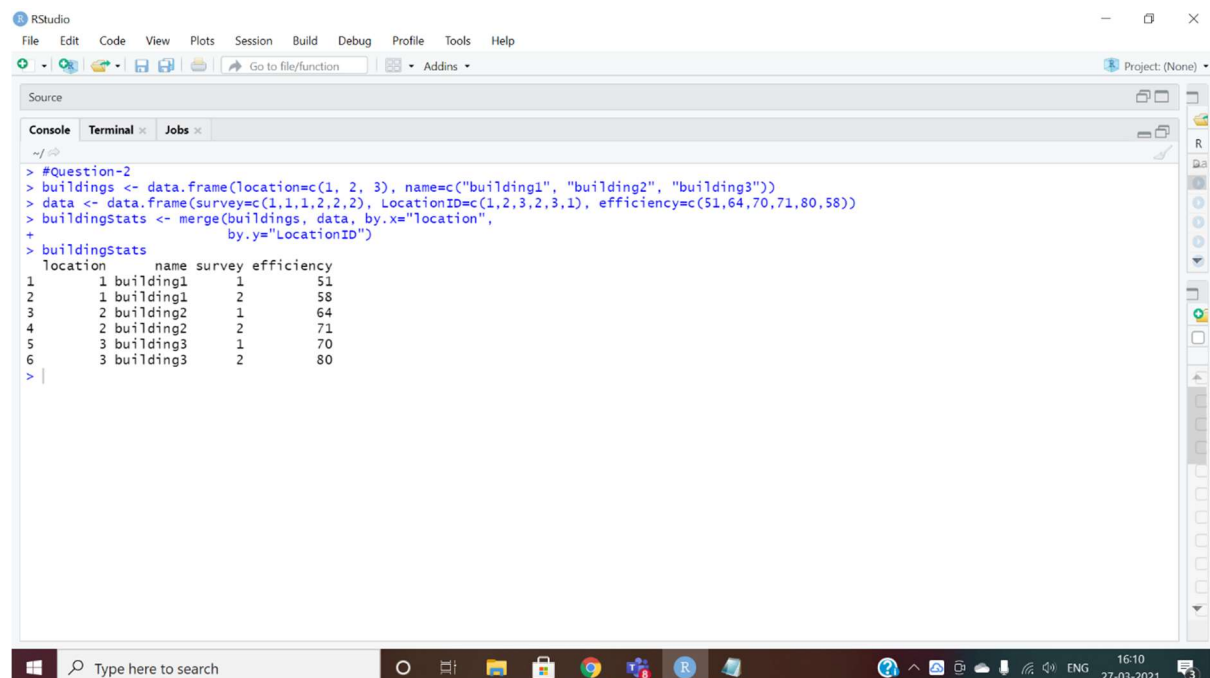
```
buildings <- data.frame(location=c(1, 2, 3), name=c("building1", "building2",  
"building3"))
```

```
data <- data.frame(survey=c(1,1,1,2,2,2), LocationID=c(1,2,3,2,3,1),  
efficiency=c(51,64,70,71,80,58))
```

The dataframes, buildings and data now have corresponding variables called, location, and LocationID. Use the merge() function to merge the columns of the two dataframes by the corresponding variables.

```
Answer: buildings <- data.frame(location=c(1, 2, 3), name=c("building1", "building2", "building3"))  
data <- data.frame(survey=c(1,1,1,2,2,2), LocationID=c(1,2,3,2,3,1), efficiency=c(51,64,70,71,80,58))  
buildingStats <- merge(buildings, data, by.x="location",  
by.y="LocationID")  
buildingStats
```

OUTPUT



The screenshot shows the RStudio interface with the console window open. The console displays the following R code and its output:

```
> #Question-2  
> buildings <- data.frame(location=c(1, 2, 3), name=c("building1", "building2", "building3"))  
> data <- data.frame(survey=c(1,1,1,2,2,2), LocationID=c(1,2,3,2,3,1), efficiency=c(51,64,70,71,80,58))  
> buildingStats <- merge(buildings, data, by.x="location",  
+ by.y="LocationID")  
> buildingStats
```

	location	name	survey	efficiency
1	1	building1	1	51
2	1	building1	2	58
3	2	building2	1	64
4	2	building2	2	71
5	3	building3	1	70
6	3	building3	2	80

3 .

Inner Join:

The R `merge()` function automatically joins the frames by common variable names. In that case, demonstrate how you would perform the merge in Question 1 without specifying the key variable.

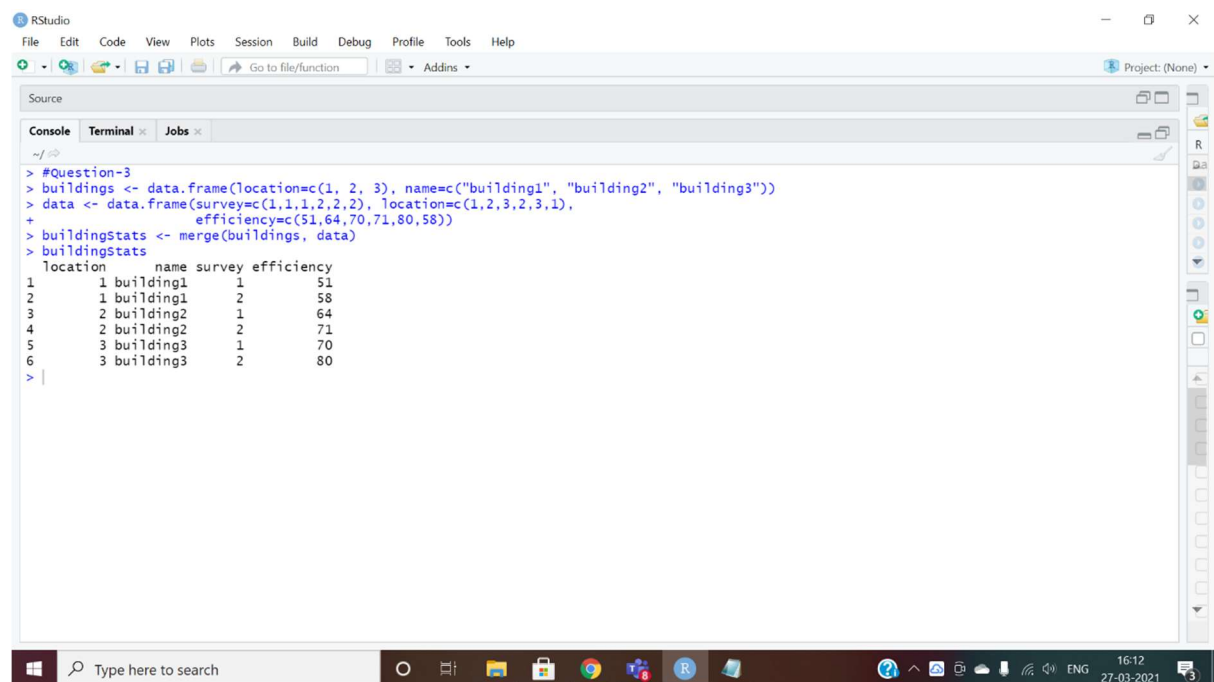
Answer: `buildings <- data.frame(location=c(1, 2, 3), name=c("building1", "building2", "building3"))`

```
data <- data.frame(survey=c(1,1,1,2,2,2), location=c(1,2,3,2,3,1),  
                  efficiency=c(51,64,70,71,80,58))
```

```
buildingStats <- merge(buildings, data)
```

```
buildingStats
```

OUTPUT



```
> #Question-3  
> buildings <- data.frame(location=c(1, 2, 3), name=c("building1", "building2", "building3"))  
> data <- data.frame(survey=c(1,1,1,2,2,2), location=c(1,2,3,2,3,1),  
+                   efficiency=c(51,64,70,71,80,58))  
> buildingStats <- merge(buildings, data)  
> buildingStats  
  location name survey efficiency  
1      1 building1      1        51  
2      1 building1      2        58  
3      2 building2      1        64  
4      2 building2      2        71  
5      3 building3      1        70  
6      3 building3      2        80  
>
```

4 .

Outer Join: Merge the two dataframes from Question 1. Use the `"all="` parameter in the `merge()` function to return all records from both tables. Also, merge with the key variable, `"location"`.

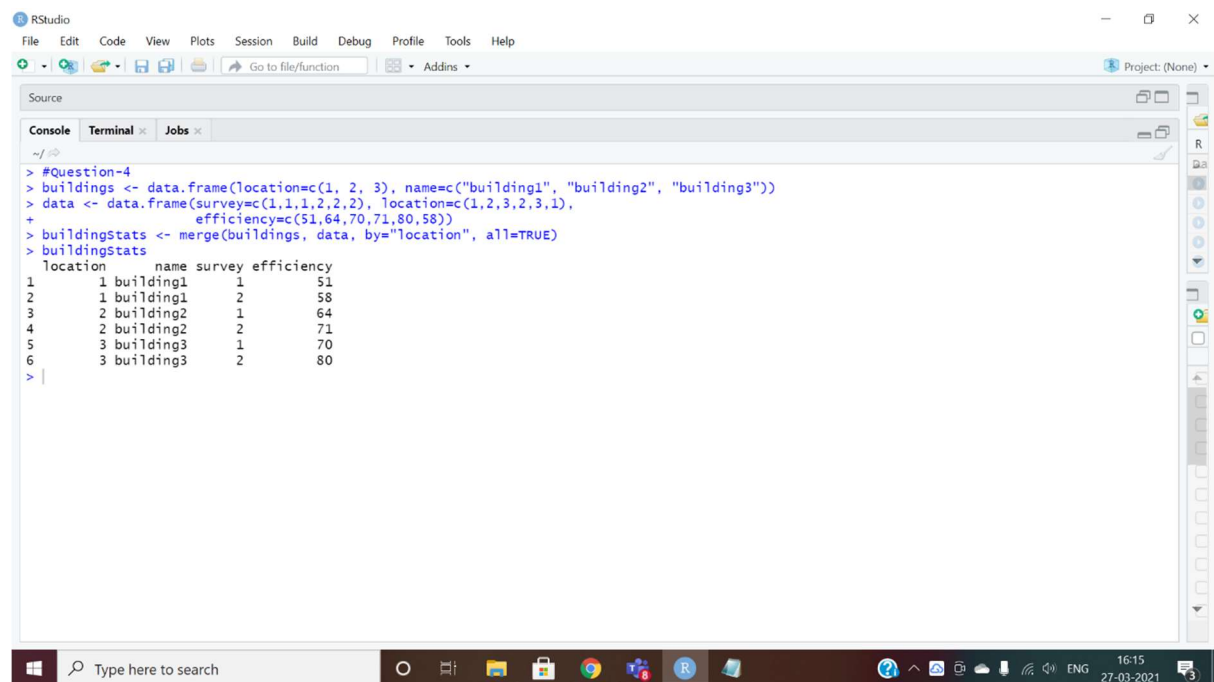
Answer: `buildings <- data.frame(location=c(1, 2, 3), name=c("building1", "building2", "building3"))`

```
data <- data.frame(survey=c(1,1,1,2,2,2), location=c(1,2,3,2,3,1),
                  efficiency=c(51,64,70,71,80,58))

buildingStats <- merge(buildings, data, by="location", all=TRUE)

buildingStats
```

OUTPUT



The screenshot shows the RStudio interface with the following code in the console:

```
> #Question-4
> buildings <- data.frame(location=c(1, 2, 3), name=c("building1", "building2", "building3"))
> data <- data.frame(survey=c(1,1,1,2,2,2), location=c(1,2,3,2,3,1),
+                   efficiency=c(51,64,70,71,80,58))
> buildingStats <- merge(buildings, data, by="location", all=TRUE)
> buildingStats
```

The output in the console is a data frame with 6 rows and 4 columns:

	location	name	survey	efficiency
1	1	building1	1	51
2	1	building1	2	58
3	2	building2	1	64
4	2	building2	2	71
5	3	building3	1	70
6	3	building3	2	80

5 .

Left Join:

Merge the two dataframes from Question 1, and return all rows from the left table.

Specify the matching key from Question 1.

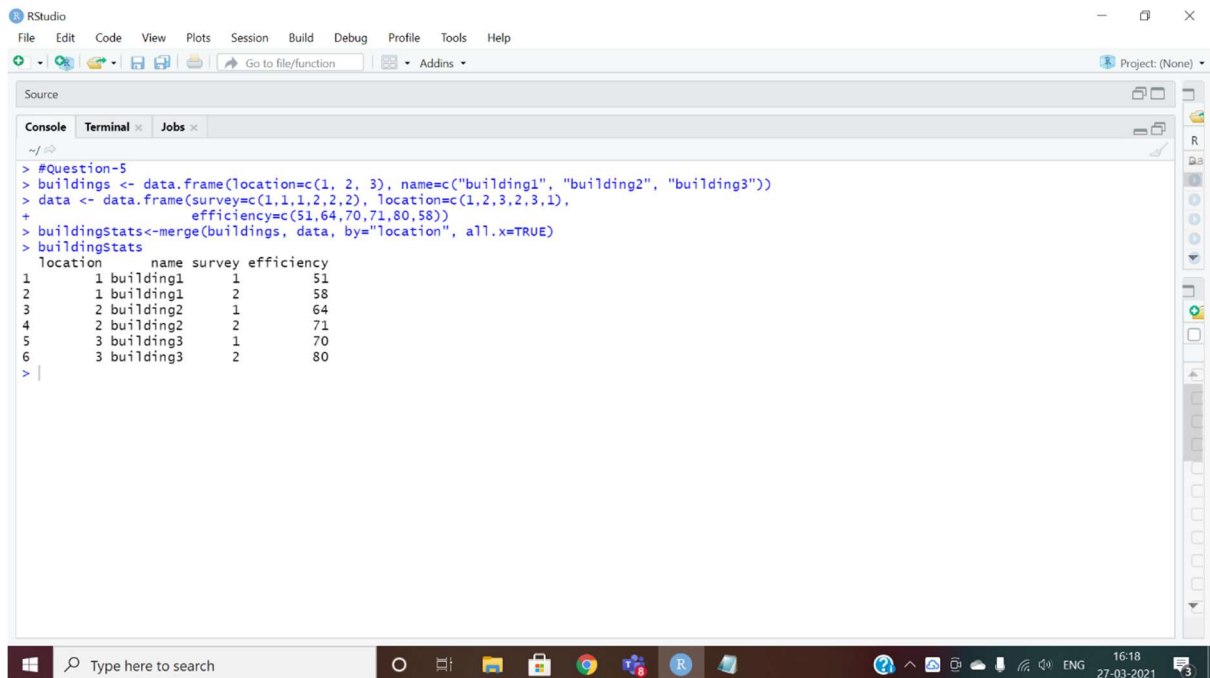
Answer: buildings <- data.frame(location=c(1, 2, 3), name=c("building1", "building2", "building3"))

```
data <- data.frame(survey=c(1,1,1,2,2,2), location=c(1,2,3,2,3,1),
                  efficiency=c(51,64,70,71,80,58))

buildingStats<-merge(buildings, data, by="location", all.x=TRUE)

buildingStats
```

OUTPUT



```
> #Question-5
> buildings <- data.frame(location=c(1, 2, 3), name=c("building1", "building2", "building3"))
> data <- data.frame(survey=c(1,1,1,2,2,2), location=c(1,2,3,2,3,1),
+                   efficiency=c(51,64,70,71,80,58))
> buildingStats<-merge(buildings, data, by="location", all.x=TRUE)
> buildingStats
  location name survey efficiency
1      1 building1     1         51
2      1 building1     2         58
3      2 building2     1         64
4      2 building2     2         71
5      3 building3     1         70
6      3 building3     2         80
> |
```

6 .

Right Join:

Merge the two dataframes from Question 1, and return all rows from the right table.

Use the matching key from Question 1 to return matching rows from the left table.

Answer: buildings <- data.frame(location=c(1, 2, 3), name=c("building1", "building2", "building3"))

```
data <- data.frame(survey=c(1,1,1,2,2,2), location=c(1,2,3,2,3,1),
```

```
                efficiency=c(51,64,70,71,80,58))
```

```
buildingStats <- merge(buildings, data, by="location", all.y=TRUE)
```

```
buildingStats
```

OUTPUT

```
> #Question-5
> buildings <- data.frame(location=c(1, 2, 3), name=c("building1", "building2", "building3"))
> data <- data.frame(survey=c(1,1,1,2,2,2), location=c(1,2,3,2,3,1),
+                   efficiency=c(51,64,70,71,80,58))
> buildingStats<-merge(buildings, data, by="location", all.x=TRUE)
> buildingStats
  location name survey efficiency
1     1 building1     1         51
2     1 building1     2         58
3     2 building2     1         64
4     2 building2     2         71
5     3 building3     1         70
6     3 building3     2         80
> |
```

7 .

Cross Join:

Merge the two dataframes from Question 1, into a “Cross Join” with each row of “buildings” matched to each row of “data”. What new column names are created in “buildingStats”?

Answer: buildings <- data.frame(location=c(1, 2, 3), name=c("building1", "building2", "building3"))

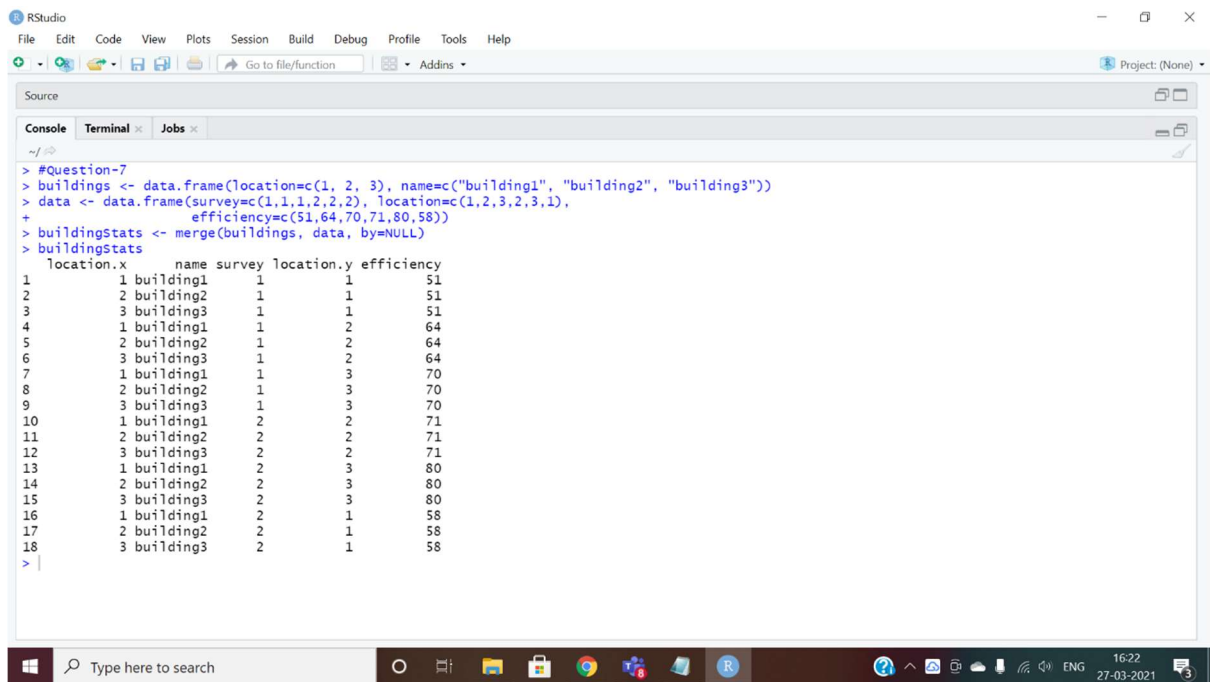
data <- data.frame(survey=c(1,1,1,2,2,2), location=c(1,2,3,2,3,1),

efficiency=c(51,64,70,71,80,58))

buildingStats <- merge(buildings, data, by=NULL)

buildingStats

OUTPUT



```
> #Question-7
> buildings <- data.frame(location=c(1, 2, 3), name=c("building1", "building2", "building3"))
> data <- data.frame(survey=c(1,1,1,2,2,2), location=c(1,2,3,2,3,1),
+                   efficiency=c(51,64,70,71,80,58))
> buildingStats <- merge(buildings, data, by=NULL)
> buildingStats
  location.x name survey location.y efficiency
1          1 building1      1          1         51
2          2 building2      1          1         51
3          3 building3      1          1         51
4          1 building1      2          2         64
5          2 building2      1          2         64
6          3 building3      1          2         64
7          1 building1      1          3         70
8          2 building2      1          3         70
9          3 building3      1          3         70
10         1 building1      2          2         71
11         2 building2      2          2         71
12         3 building3      2          2         71
13         1 building1      2          3         80
14         2 building2      2          3         80
15         3 building3      2          3         80
16         1 building1      2          1         58
17         2 building2      2          1         58
18         3 building3      2          1         58
> |
```

8.

Merging Dataframe rows:

To join two data frames (datasets) vertically, use the `rbind` function. The two data frames must have the same variables, but they do not have to be in the same order.

Merge the rows of the following two dataframes:

```
buildings <- data.frame(location=c(1, 2, 3), name=c("building1", "building2",
"building3"))
```

```
buildings2 <- data.frame(location=c(5, 4, 6), name=c("building5", "building4",
"building6"))
```

Also, specify a new dataframe, "allBuidings".

Answer: `buildings <- data.frame(location=c(1, 2, 3), name=c("building1", "building2", "building3"))`

```
buildings2 <- data.frame(location=c(5, 4, 6), name=c("building5", "building4", "building6"))
```

```
allBuidlings <- rbind(buildings, buildings2)
```

```
allBuidlings
```

OUTPUT

```
RStudio
File Edit Code View Plots Session Build Debug Profile Tools Help
Source
Console Terminal Jobs
~/
> #Question-8
> buildings<-data.frame(location=c(1, 2, 3), name=c("building1", "building2", "building3"))
> buildings2<-data.frame(location=c(5, 4, 6), name=c("building5", "building4", "building6"))
> allBuildings<-rbind(buildings, buildings2)
> allBuildings
  location      name
1         1 building1
2         2 building2
3         3 building3
4         5 building5
5         4 building4
6         6 building6
>
```

9.

Apply different join operations on the tables given below. Write the expected outputs.

Super Heroes

Name	Alignment	Gender	Publisher
Magneto	bad	male	Marvel
Storm	good	female	Marvel
Mystique	bad	female	Marvel
Batman	good	male	DC
Joker	bad	male	DC
Catwoman	bad	female	DC
Hellboy	good	male	Dark Horse Comics

Publishers

publisher	yr_founded
DC	1934
Marvel	1939
Image	1992

Answer:

1)Inner Join

```
inner join::suppressPackageStartupMessages(library(dplyr))
```

```
library(readr)
```

```
superheroes <- "
```

```
  name, alignment, gender,    publisher
```

```
Magneto,    bad,  male,    Marvel
```

```
Storm,     good, female,    Marvel
```

```
Mystique,   bad, female,    Marvel
```

```
Batman,     good,  male,     DC
```

```
Joker,     bad,  male,     DC
```

```
Catwoman,   bad, female,     DC
```

```
Hellboy,    good,  male, Dark Horse Comics
```

```
"
```

```
superheroes <- read_csv(superheroes, trim_ws = TRUE, skip = 1)
```

```
publishers <- "
```

```
  publisher, yr_founded
```

```
    DC,    1934
```

```
    Marvel,  1939
```

```
    Image,   1992
```

```
"
```

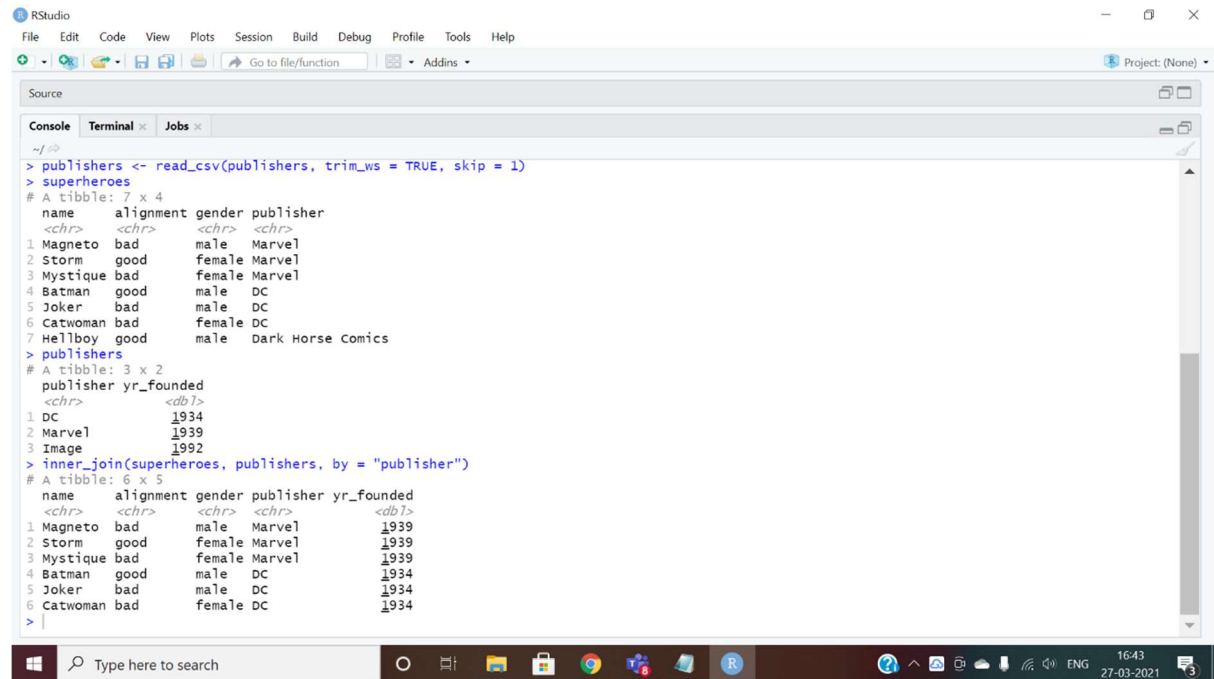
```
publishers <- read_csv(publishers, trim_ws = TRUE, skip = 1)
```

superheroes

publishers

```
inner_join(superheroes, publishers, by = "publisher")
```

OUTPUT



```
RStudio
File Edit Code View Plots Session Build Debug Profile Tools Help
Source
Console Terminal Jobs
~/
> publishers <- read_csv(publishers, trim_ws = TRUE, skip = 1)
> superheroes
# A tibble: 7 x 4
  name alignment gender publisher
<chr> <chr> <chr> <chr>
1 Magneto bad male Marvel
2 Storm good female Marvel
3 Mystique bad female Marvel
4 Batman good male DC
5 Joker bad male DC
6 Catwoman bad female DC
7 Hellboy good male Dark Horse Comics
> publishers
# A tibble: 3 x 2
  publisher yr_founded
<chr> <dbl>
1 DC 1934
2 Marvel 1939
3 Image 1992
> inner_join(superheroes, publishers, by = "publisher")
# A tibble: 6 x 5
  name alignment gender publisher yr_founded
<chr> <chr> <chr> <chr> <dbl>
1 Magneto bad male Marvel 1939
2 Storm good female Marvel 1939
3 Mystique bad female Marvel 1939
4 Batman good male DC 1934
5 Joker bad male DC 1934
6 Catwoman bad female DC 1934
>
```

2)Full Join

```
full_join(superheroes, publishers, by = "publisher")
```

OUTPUT

```

RStudio
File Edit Code View Plots Session Build Debug Profile Tools Help
Go to file/function Addins
Project: (None)

Source
Console Terminal Jobs

~/
# A tibble: 7 x 4
  name      alignment gender publisher
<chr>    <chr>    <chr>    <chr>
1 Magneto    bad      male    Marvel
2 Storm      good     female  Marvel
3 Mystique   bad      female  Marvel
4 Batman     good     male    DC
5 Joker      bad      male    DC
6 Catwoman   bad      female  DC
7 Hellboy    good     male    Dark Horse Comics
> publishers
# A tibble: 3 x 2
  publisher yr_founded
<chr>      <dbl>
1 DC        1934
2 Marvel    1939
3 Image     1992
> full_join(superheroes, publishers, by = "publisher")
# A tibble: 8 x 5
  name      alignment gender publisher      yr_founded
<chr>    <chr>    <chr>    <chr>      <dbl>
1 Magneto    bad      male    Marvel    1939
2 Storm      good     female  Marvel    1939
3 Mystique   bad      female  Marvel    1939
4 Batman     good     male    DC        1934
5 Joker      bad      male    DC        1934
6 Catwoman   bad      female  DC        1934
7 Hellboy    good     male    Dark Horse Comics NA
8 NA         NA      NA      Image     1992
>

```

3)Semi join:

`semi_join(superheroes, publishers, by = "publisher")`

OUTPUT

```

RStudio
File Edit Code View Plots Session Build Debug Profile Tools Help
Go to file/function Addins
Project: (None)

Source
Console Terminal Jobs

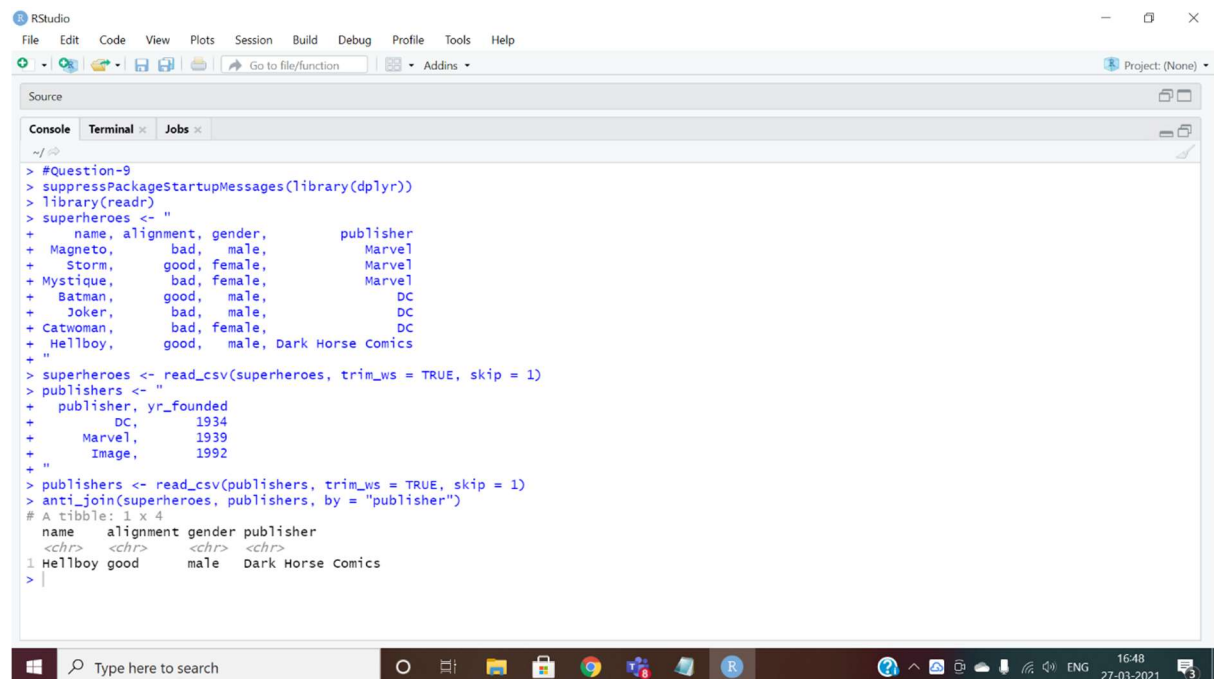
~/
> library(readr)
> superheroes <- "
+ name, alignment, gender, publisher
+ Magneto, bad, male, Marvel
+ Storm, good, female, Marvel
+ Mystique, bad, female, Marvel
+ Batman, good, male, DC
+ Joker, bad, male, DC
+ Catwoman, bad, female, DC
+ Hellboy, good, male, Dark Horse Comics
+ "
> superheroes <- read_csv(superheroes, trim_ws = TRUE, skip = 1)
> publishers <- "
+ publisher, yr_founded
+ DC, 1934
+ Marvel, 1939
+ Image, 1992
+ "
> publishers <- read_csv(publishers, trim_ws = TRUE, skip = 1)
> semi_join(superheroes, publishers, by = "publisher")
# A tibble: 6 x 4
  name      alignment gender publisher
<chr>    <chr>    <chr>    <chr>
1 Magneto    bad      male    Marvel
2 Storm      good     female  Marvel
3 Mystique   bad      female  Marvel
4 Batman     good     male    DC
5 Joker      bad      male    DC
6 Catwoman   bad      female  DC
>

```

4)Anti Join:

`anti_join(superheroes, publishers, by = "publisher")`

OUTPUT

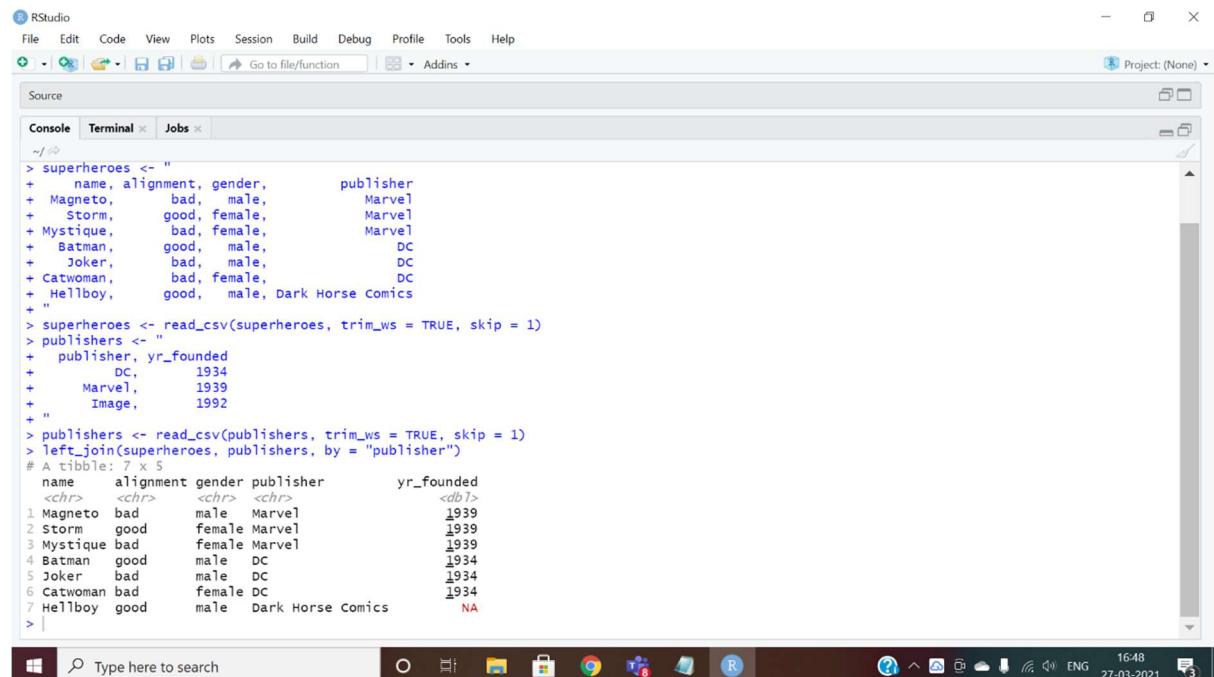


```
RStudio
File Edit Code View Plots Session Build Debug Profile Tools Help
Source
Console Terminal Jobs
~/
> #Question-9
> suppressPackageStartupMessages(library(dplyr))
> library(readr)
> superheroes <- "
+   name, alignment, gender, publisher
+   Magneto, bad, male, Marvel
+   Storm, good, female, Marvel
+   Mystique, bad, female, Marvel
+   Batman, good, male, DC
+   Joker, bad, male, DC
+   Catwoman, bad, female, DC
+   Hellboy, good, male, Dark Horse Comics
+ "
> superheroes <- read_csv(superheroes, trim_ws = TRUE, skip = 1)
> publishers <- "
+   publisher, yr_founded
+   DC, 1934
+   Marvel, 1939
+   Image, 1992
+ "
> publishers <- read_csv(publishers, trim_ws = TRUE, skip = 1)
> anti_join(superheroes, publishers, by = "publisher")
# A tibble: 1 x 4
  name alignment gender publisher
<chr> <chr> <chr> <chr>
1 Hellboy good male Dark Horse Comics
>
```

5)Left Join:

`left_join(superheroes, publishers, by = "publisher")`

OUTPUT

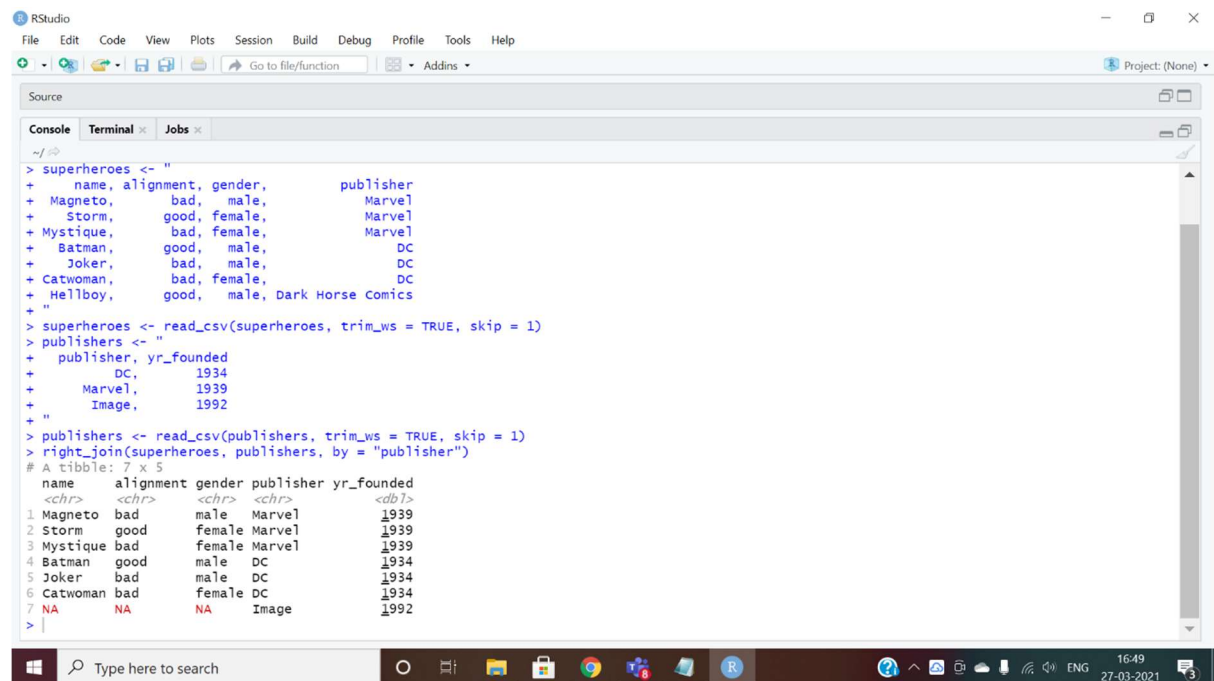


```
RStudio
File Edit Code View Plots Session Build Debug Profile Tools Help
Source
Console Terminal Jobs
~/
> superheroes <- "
+   name, alignment, gender, publisher
+   Magneto, bad, male, Marvel
+   Storm, good, female, Marvel
+   Mystique, bad, female, Marvel
+   Batman, good, male, DC
+   Joker, bad, male, DC
+   Catwoman, bad, female, DC
+   Hellboy, good, male, Dark Horse Comics
+ "
> superheroes <- read_csv(superheroes, trim_ws = TRUE, skip = 1)
> publishers <- "
+   publisher, yr_founded
+   DC, 1934
+   Marvel, 1939
+   Image, 1992
+ "
> publishers <- read_csv(publishers, trim_ws = TRUE, skip = 1)
> left_join(superheroes, publishers, by = "publisher")
# A tibble: 7 x 5
  name alignment gender publisher yr_founded
<chr> <chr> <chr> <chr> <dbl>
1 Magneto bad male Marvel 1939
2 Storm good female Marvel 1939
3 Mystique bad female Marvel 1939
4 Batman good male DC 1934
5 Joker bad male DC 1934
6 Catwoman bad female DC 1934
7 Hellboy good male Dark Horse Comics NA
>
```

6)Right Join:

`right_join(superheroes, publishers, by = "publisher")`

OUTPUT



```
RStudio
File Edit Code View Plots Session Build Debug Profile Tools Help
Source
Console Terminal Jobs
~/
> superheroes <- "
+   name, alignment, gender, publisher
+   Magneto, bad, male, Marvel
+   Storm, good, female, Marvel
+   Mystique, bad, female, Marvel
+   Batman, good, male, DC
+   Joker, bad, male, DC
+   Catwoman, bad, female, DC
+   Hellboy, good, male, Dark Horse Comics
+ "
> superheroes <- read_csv(superheroes, trim_ws = TRUE, skip = 1)
> publishers <- "
+   publisher, yr_founded
+   DC, 1934
+   Marvel, 1939
+   Image, 1992
+ "
> publishers <- read_csv(publishers, trim_ws = TRUE, skip = 1)
> right_join(superheroes, publishers, by = "publisher")
# A tibble: 7 x 5
  name alignment gender publisher yr_founded
<chr> <chr> <chr> <chr> <dbl>
1 Magneto bad male Marvel 1939
2 Storm good female Marvel 1939
3 Mystique bad female Marvel 1939
4 Batman good male DC 1934
5 Joker bad male DC 1934
6 Catwoman bad female DC 1934
7 NA NA NA Image 1992
> |
```

10.

Use the `merge()` function to merge the mentioned dataframes.

```
authors <- data.frame(
  surname = c("Tukey", "Venables", "Tierney", "Ripley", "McNeil"),
  nationality = c("US", "Australia", "US", "UK", "Australia"),
  retired = c("yes", rep("no", 4)))

books <- data.frame(
  name = c("Tukey", "Venables", "Tierney", "Ripley", "Ripley", "McNeil"),
  title = c("Exploratory Data Analysis",
    "Modern Applied Statistics ...",
    "LISP-STAT",
    "Spatial Statistics", "Stochastic Simulation",
    "Interactive Data Analysis"),
  other.author = c(NA, "Ripley", NA, NA, NA, NA))
```

```

Answer: authors <- data.frame(

  surname = c("Tukey", "Venables", "Tierney", "Ripley", "McNeil"),

  nationality = c("US", "Australia", "US", "UK", "Australia"),

  retired = c("yes", rep("no", 4)))

books <- data.frame(

  name = c("Tukey", "Venables", "Tierney", "Ripley", "Ripley", "McNeil"),

  title = c("Exploratory Data Analysis",

            "Modern Applied Statistics ...",

            "LISP-STAT",

            "Spatial Statistics", "Stochastic Simulation",

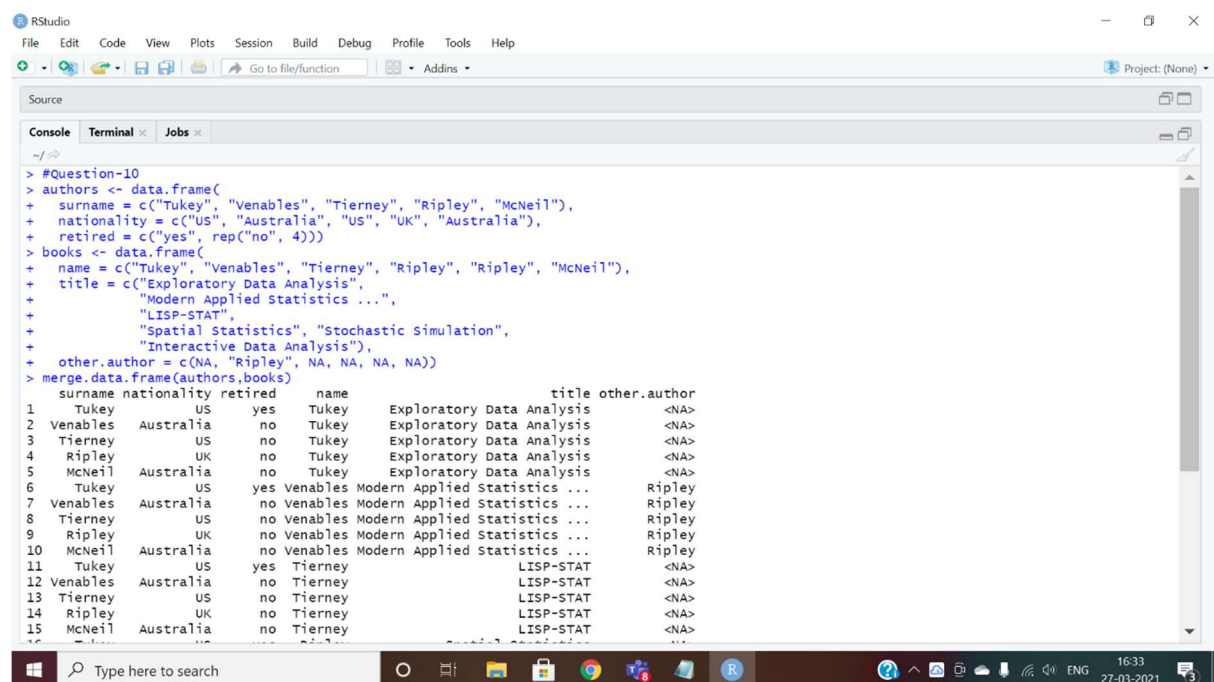
            "Interactive Data Analysis"),

  other.author = c(NA, "Ripley", NA, NA, NA, NA))

merge.data.frame(authors,books)

```

OUTPUT



The screenshot shows the RStudio interface with the following code executed in the console:

```

> #Question-10
> authors <- data.frame(
+   surname = c("Tukey", "Venables", "Tierney", "Ripley", "McNeil"),
+   nationality = c("US", "Australia", "US", "UK", "Australia"),
+   retired = c("yes", rep("no", 4)))
> books <- data.frame(
+   name = c("Tukey", "Venables", "Tierney", "Ripley", "Ripley", "McNeil"),
+   title = c("Exploratory Data Analysis",
+             "Modern Applied Statistics ...",
+             "LISP-STAT",
+             "Spatial Statistics", "Stochastic Simulation",
+             "Interactive Data Analysis"),
+   other.author = c(NA, "Ripley", NA, NA, NA, NA))
> merge.data.frame(authors,books)

```

The output in the console is a merged data frame with 16 rows and 7 columns:

	surname	nationality	retired	name	title	other.author
1	Tukey	US	yes	Tukey	Exploratory Data Analysis	<NA>
2	Venables	Australia	no	Tukey	Exploratory Data Analysis	<NA>
3	Tierney	US	no	Tukey	Exploratory Data Analysis	<NA>
4	Ripley	UK	no	Tukey	Exploratory Data Analysis	<NA>
5	McNeil	Australia	no	Tukey	Exploratory Data Analysis	<NA>
6	Tukey	US	yes	Venables	Modern Applied Statistics ...	Ripley
7	Venables	Australia	no	Venables	Modern Applied Statistics ...	Ripley
8	Tierney	US	no	Venables	Modern Applied Statistics ...	Ripley
9	Ripley	UK	no	Venables	Modern Applied Statistics ...	Ripley
10	McNeil	Australia	no	Venables	Modern Applied Statistics ...	Ripley
11	Tukey	US	yes	Tierney	LISP-STAT	<NA>
12	Venables	Australia	no	Tierney	LISP-STAT	<NA>
13	Tierney	US	no	Tierney	LISP-STAT	<NA>
14	Ripley	UK	no	Tierney	LISP-STAT	<NA>
15	McNeil	Australia	no	Tierney	LISP-STAT	<NA>

RStudio

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Source

Console Terminal Jobs

```
~/
2 Venables Australia no Tukey Exploratory Data Analysis <NA>
3 Tierney US no Tukey Exploratory Data Analysis <NA>
4 Ripley UK no Tukey Exploratory Data Analysis <NA>
5 McNeil Australia no Tukey Exploratory Data Analysis <NA>
6 Tukey US yes Venables Modern Applied Statistics ... Ripley
7 Venables Australia no Venables Modern Applied Statistics ... Ripley
8 Tierney US no Venables Modern Applied Statistics ... Ripley
9 Ripley UK no Venables Modern Applied Statistics ... Ripley
10 McNeil Australia no Venables Modern Applied Statistics ... Ripley
11 Tukey US yes Tierney LISP-STAT <NA>
12 Venables Australia no Tierney LISP-STAT <NA>
13 Tierney US no Tierney LISP-STAT <NA>
14 Ripley UK no Tierney LISP-STAT <NA>
15 McNeil Australia no Tierney LISP-STAT <NA>
16 Tukey US yes Ripley Spatial Statistics <NA>
17 Venables Australia no Ripley Spatial Statistics <NA>
18 Tierney US no Ripley Spatial Statistics <NA>
19 Ripley UK no Ripley Spatial Statistics <NA>
20 McNeil Australia no Ripley Spatial Statistics <NA>
21 Tukey US yes Ripley Stochastic Simulation <NA>
22 Venables Australia no Ripley Stochastic Simulation <NA>
23 Tierney US no Ripley Stochastic Simulation <NA>
24 Ripley UK no Ripley Stochastic Simulation <NA>
25 McNeil Australia no Ripley Stochastic Simulation <NA>
26 Tukey US yes McNeil Interactive Data Analysis <NA>
27 Venables Australia no McNeil Interactive Data Analysis <NA>
28 Tierney US no McNeil Interactive Data Analysis <NA>
29 Ripley UK no McNeil Interactive Data Analysis <NA>
30 McNeil Australia no McNeil Interactive Data Analysis <NA>
>
```

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