FDA Lab-5

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20BCD7138

```r
#KHAN MOHD OWAIS RAZA
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data(mtcars)

# 1. Print the dataset mtcars
print(mtcars)

# 2. Print the structure of the dataset
str(mtcars)

# 3. What is the datatype of the dataset?
# The datatype of the mtcars dataset is 'data.frame'.

# 4. How many columns and rows are there in the dataset?
# Number of columns
num_columns <- ncol(mtcars)
print(num_columns)

# Number of rows
num_rows <- nrow(mtcars)
print(num_rows)

# 5. What information (structure summary) you will get from str()
function?
# The str() function provides the structure summary of the
dataset, including the column names, data types, and a preview of
the data.

# 6. Print the row names
print(rownames(mtcars))

# 7. Print the column names
print(colnames(mtcars))

# 8. Print the number of columns in mtcars
num_columns <- ncol(mtcars)
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print(num_columns)

# 9. Print the number of rows
num_rows <- nrow(mtcars)
print(num_rows)

# 10. Print all the elements of the 2nd row
print(mtcars[2, ])

# 11. Print all the elements of the 2nd, 5th, and 13th row
print(mtcars[c(2, 5, 13), ])

# 12. Print the elements of rows from 15 to 20
print(mtcars[15:20, ])

# 13. Print the elements of rows from 13 to 24, 28, and 30
print(mtcars[c(13:24, 28, 30), ])

# 14. Print all odd indexed rows (rows 1, 3, 5, ...)
odd_rows <- seq(1, num_rows, 2)
print(mtcars[odd_rows, ])

# 15. Print all even indexed rows (rows 2, 4, 6, ...)
even_rows <- seq(2, num_rows, 2)
print(mtcars[even_rows, ])

# 16. Print every 3rd row from the 1st row (1, 4, 7, 10, ...)
third_rows <- seq(1, num_rows, 3)
print(mtcars[third_rows, ])

# 17. Print the first row and last row
print(mtcars[c(1, num_rows), ])

# 18. Print the last 3 rows without using the tail() function
print(mtcars[(num_rows - 2):num_rows, ])

# 19. Print the elements of the 3rd column
print(mtcars[, 3])

# 20. Print the elements of the column with name "wt"
print(mtcars[, "wt"])
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# 21. Print the elements of columns "mpg" and "qsec"
print(mtcars[, c("mpg", "qsec")])

# 22. Print the first three columns
print(mtcars[, 1:3])

# 23. Print the elements of columns from 5 to 10
print(mtcars[, 5:10])

# 24. Print the elements of columns from 3 to 7, 9, and 11
print(mtcars[, c(3:7, 9, 11)])

# 25. Print all odd indexed columns (1, 3, 5, ...)
odd_columns <- seq(1, num_columns, 2)
print(mtcars[, odd_columns])

# 26. Print all even indexed columns (2, 4, 6, ...)
even_columns <- seq(2, num_columns, 2)
print(mtcars[, even_columns])

# 27. Print every 3rd column from the 1st column (1, 4, 7, 10,
...)
third_columns <- seq(1, num_columns, 3)
print(mtcars[, third_columns])

# 28. Print the first column and last column
print(mtcars[, c(1, num_columns)])

# 29. Print the last 3 columns
print(mtcars[, (num_columns - 2):num_columns])

# 30. Print the first row and 2nd and 3rd column
print(mtcars[1, c(2, 3)])

# 31. Print the first two rows and the second and third column
print(mtcars[1:2, c(2, 3)])

# 32. Print the element at the 2nd row, 3rd column
print(mtcars[2, 3])

# 33. Print all the rows having "mpg" value greater than 14
print(mtcars[mtcars$mpg > 14, ])
```
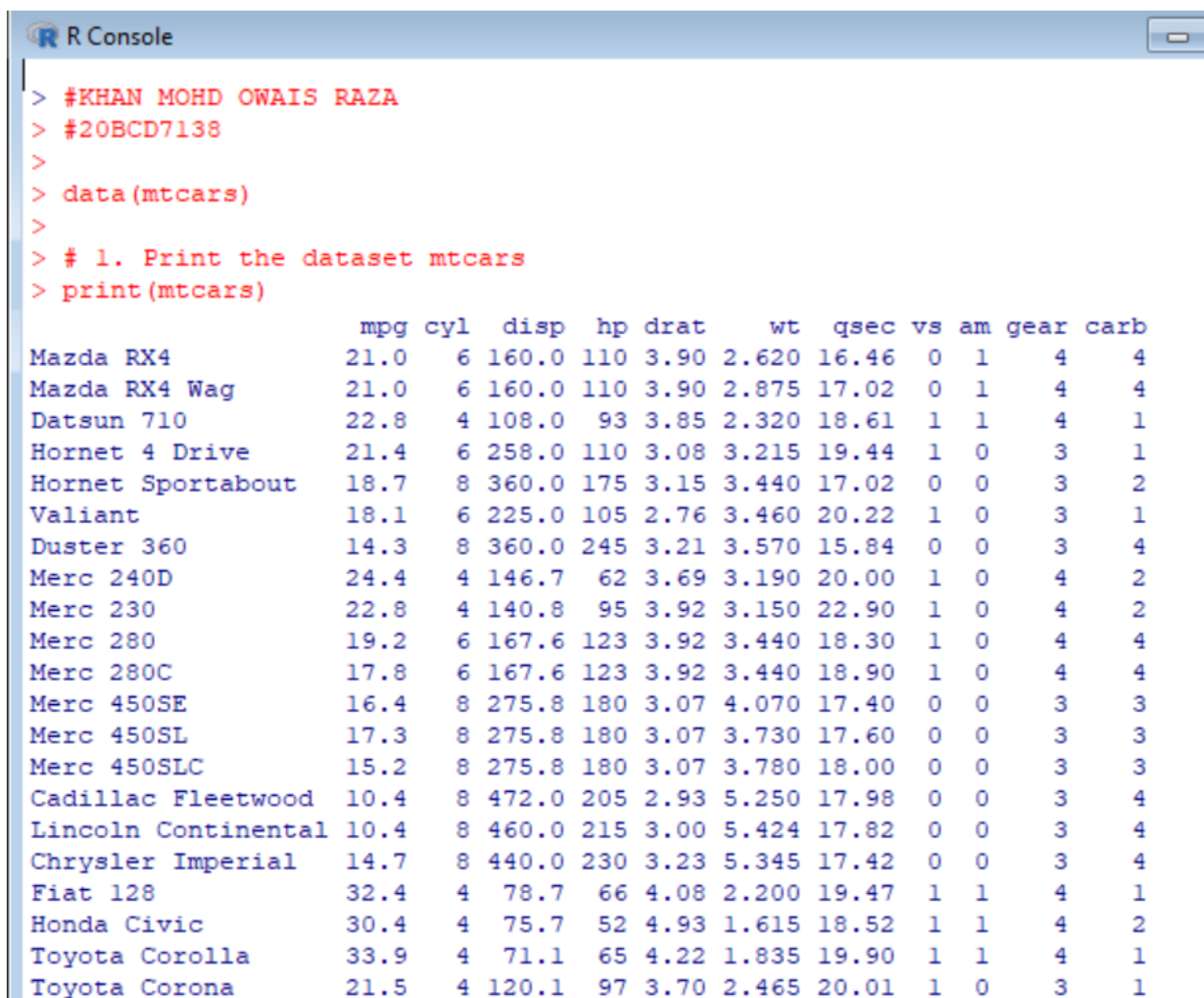
```
# 34. Print all the rows having "hp" value less than 100
print(mtcars[mtcars$hp < 100, ])

# 35. Print all the rows having "disp" value between 100 and 200
print(mtcars[mtcars$disp > 100 & mtcars$disp < 200, ])

# 35. Use head() and tail() commands to display sample
observations of mtcars dataset.
head(mtcars)
tail(mtcars)

# 36. Use head() command to print the first 10 observations.
head(mtcars, 10)

# 37. Use tail() command to print the last 15 observations.
tail(mtcars, 15)
```

```
Dodge Challenger      15.5    8 318.0 150 2.76 3.520 16.87  0 0   3   2
AMC Javelin           15.2    8 304.0 150 3.15 3.435 17.30  0 0   3   2
Camaro Z28            13.3    8 350.0 245 3.73 3.840 15.41  0 0   3   4
Pontiac Firebird      19.2    8 400.0 175 3.08 3.845 17.05  0 0   3   2
Fiat X1-9             27.3    4  79.0  66 4.08 1.935 18.90  1 1   4   1
Porsche 914-2         26.0    4 120.3  91 4.43 2.140 16.70  0 1   5   2
Lotus Europa          30.4    4  95.1 113 3.77 1.513 16.90  1 1   5   2
Ford Pantera L        15.8    8 351.0 264 4.22 3.170 14.50  0 1   5   4
Ferrari Dino          19.7    6 145.0 175 3.62 2.770 15.50  0 1   5   6
Maserati Bora         15.0    8 301.0 335 3.54 3.570 14.60  0 1   5   8
Volvo 142E            21.4    4 121.0 109 4.11 2.780 18.60  1 1   4   2
>
> # 2. Print the structure of the dataset
> str(mtcars)
'data.frame':   32 obs. of  11 variables:
 $ mpg : num  21 21 22.8 21.4 18.7 18.1 14.3 24.4 22.8 19.2 ...
 $ cyl : num  6 6 4 6 8 6 8 4 4 6 ...
 $ disp: num  160 160 108 258 360 ...
 $ hp  : num  110 110 93 110 175 105 245 62 95 123 ...
 $ drat: num  3.9 3.9 3.85 3.08 3.15 2.76 3.21 3.69 3.92 3.92 ...
 $ wt  : num  2.62 2.88 2.32 3.21 3.44 ...
 $ qsec: num  16.5 17 18.6 19.4 17 ...
 $ vs  : num  0 0 1 1 0 1 0 1 1 1 ...
 $ am  : num  1 1 1 0 0 0 0 0 0 0 ...
 $ gear: num  4 4 4 3 3 3 3 4 4 4 ...
 $ carb: num  4 4 1 1 2 1 4 2 2 4 ...
> # 3. What is the datatype of the dataset?
> # The datatype of the mtcars dataset is 'data.frame'.
>
> # 4. How many columns and rows are there in the dataset?
> # Number of columns
> num_columns <- ncol(mtcars)
> print(num_columns)
[1] 11
>
> # Number of rows
> num_rows <- nrow(mtcars)
> print(num_rows)
[1] 32
>
>
> # 6. Print the row names
> print(rownames(mtcars))
 [1] "Mazda RX4"           "Mazda RX4 Wag"       "Datsun 710"
 [4] "Hornet 4 Drive"      "Hornet Sportabout"   "Valiant"
 [7] "Duster 360"          "Merc 240D"           "Merc 230"
[10] "Merc 280"            "Merc 280C"           "Merc 450SE"
[13] "Merc 450SL"          "Merc 450SLC"         "Cadillac Fleetwood"
[16] "Lincoln Continental" "Chrysler Imperial"   "Fiat 128"
[19] "Honda Civic"         "Toyota Corolla"      "Toyota Corona"
[22] "Dodge Challenger"    "AMC Javelin"         "Camaro Z28"
[25] "Pontiac Firebird"    "Fiat X1-9"           "Porsche 914-2"
[28] "Lotus Europa"        "Ford Pantera L"      "Ferrari Dino"
[31] "Maserati Bora"       "Volvo 142E"
>
> # 7. Print the column names
> print(colnames(mtcars))
 [1] "mpg"  "cyl"  "disp" "hp"   "drat" "wt"   "qsec" "vs"   "am"   "gear"
[11] "carb"
>
```

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> # 8. Print the number of columns in mtcars
> num_columns <- ncol(mtcars)
> print(num_columns)
[1] 11
>
> # 9. Print the number of rows
> num_rows <- nrow(mtcars)
> print(num_rows)
[1] 32
>
> # 10. Print all the elements of the 2nd row
> print(mtcars[2, ])
              mpg cyl disp  hp drat    wt  qsec vs am gear carb
Mazda RX4 Wag  21   6  160 110  3.9 2.875 17.02  0  1    4    4
>
> # 11. Print all the elements of the 2nd, 5th, and 13th row
> print(mtcars[c(2, 5, 13), ])
                   mpg cyl  disp  hp drat    wt  qsec vs am gear carb
Mazda RX4 Wag     21.0   6 160.0 110 3.90 2.875 17.02  0  1    4    4
Hornet Sportabout 18.7   8 360.0 175 3.15 3.440 17.02  0  0    3    2
Merc 450SL        17.3   8 275.8 180 3.07 3.730 17.60  0  0    3    3
>
> # 12. Print the elements of rows from 15 to 20
> print(mtcars[15:20, ])
                    mpg cyl  disp  hp drat    wt  qsec vs am gear carb
Cadillac Fleetwood 10.4   8 472.0 205 2.93 5.250 17.98  0  0    3    4
Lincoln Continental 10.4  8 460.0 215 3.00 5.424 17.82  0  0    3    4
Chrysler Imperial  14.7   8 440.0 230 3.23 5.345 17.42  0  0    3    4
Fiat 128           32.4   4  78.7  66 4.08 2.200 19.47  1  1    4    1
Honda Civic        30.4   4  75.7  52 4.93 1.615 18.52  1  1    4    2
Toyota Corolla     33.9   4  71.1  65 4.22 1.835 19.90  1  1    4    1
>
> # 13. Print the elements of rows from 13 to 24, 28, and 30
> print(mtcars[c(13:24, 28, 30), ])
                    mpg cyl  disp  hp drat    wt  qsec vs am gear carb
Merc 450SL         17.3   8 275.8 180 3.07 3.730 17.60  0  0    3    3
Merc 450SLC        15.2   8 275.8 180 3.07 3.780 18.00  0  0    3    3
Cadillac Fleetwood 10.4   8 472.0 205 2.93 5.250 17.98  0  0    3    4
Lincoln Continental 10.4  8 460.0 215 3.00 5.424 17.82  0  0    3    4
Chrysler Imperial  14.7   8 440.0 230 3.23 5.345 17.42  0  0    3    4
Fiat 128           32.4   4  78.7  66 4.08 2.200 19.47  1  1    4    1
Honda Civic        30.4   4  75.7  52 4.93 1.615 18.52  1  1    4    2
Toyota Corolla     33.9   4  71.1  65 4.22 1.835 19.90  1  1    4    1
Toyota Corona      21.5   4 120.1  97 3.70 2.465 20.01  1  0    3    1
Dodge Challenger   15.5   8 318.0 150 2.76 3.520 16.87  0  0    3    2
AMC Javelin        15.2   8 304.0 150 3.15 3.435 17.30  0  0    3    2
Camaro Z28         13.3   8 350.0 245 3.73 3.840 15.41  0  0    3    4
Lotus Europa       30.4   4  95.1 113 3.77 1.513 16.90  1  1    5    2
Ferrari Dino       19.7   6 145.0 175 3.62 2.770 15.50  0  1    5    6
>
> # 14. Print all odd indexed rows (rows 1, 3, 5, ...)
> odd_rows <- seq(1, num_rows, 2)
> print(mtcars[odd_rows, ])
```

```
                    mpg cyl  disp  hp drat    wt  qsec vs am gear carb
Mazda RX4          21.0   6 160.0 110 3.90 2.620 16.46  0  1    4    4
Datsun 710         22.8   4 108.0  93 3.85 2.320 18.61  1  1    4    1
Hornet Sportabout  18.7   8 360.0 175 3.15 3.440 17.02  0  0    3    2
Duster 360         14.3   8 360.0 245 3.21 3.570 15.84  0  0    3    4
Merc 230           22.8   4 140.8  95 3.92 3.150 22.90  1  0    4    2
Merc 280C          17.8   6 167.6 123 3.92 3.440 18.90  1  0    4    4
Merc 450SL         17.3   8 275.8 180 3.07 3.730 17.60  0  0    3    3
Cadillac Fleetwood 10.4   8 472.0 205 2.93 5.250 17.98  0  0    3    4
Chrysler Imperial  14.7   8 440.0 230 3.23 5.345 17.42  0  0    3    4
Honda Civic        30.4   4  75.7  52 4.93 1.615 18.52  1  1    4    2
Toyota Corona      21.5   4 120.1  97 3.70 2.465 20.01  1  0    3    1
AMC Javelin        15.2   8 304.0 150 3.15 3.435 17.30  0  0    3    2
Pontiac Firebird   19.2   8 400.0 175 3.08 3.845 17.05  0  0    3    2
Porsche 914-2      26.0   4 120.3  91 4.43 2.140 16.70  0  1    5    2
Ford Pantera L     15.8   8 351.0 264 4.22 3.170 14.50  0  1    5    4
Maserati Bora      15.0   8 301.0 335 3.54 3.570 14.60  0  1    5    8
> 
> 
> # 15. Print all even indexed rows (rows 2, 4, 6, ...)
> even_rows <- seq(2, num_rows, 2)
> print(mtcars[even_rows, ])
                     mpg cyl  disp  hp drat    wt  qsec vs am gear carb
Mazda RX4 Wag       21.0   6 160.0 110 3.90 2.875 17.02  0  1    4    4
Hornet 4 Drive      21.4   6 258.0 110 3.08 3.215 19.44  1  0    3    1
Valiant             18.1   6 225.0 105 2.76 3.460 20.22  1  0    3    1
Merc 240D           24.4   4 146.7  62 3.69 3.190 20.00  1  0    4    2
Merc 280            19.2   6 167.6 123 3.92 3.440 18.30  1  0    4    4
Merc 450SE          16.4   8 275.8 180 3.07 4.070 17.40  0  0    3    3
Merc 450SLC         15.2   8 275.8 180 3.07 3.780 18.00  0  0    3    3
Lincoln Continental 10.4   8 460.0 215 3.00 5.424 17.82  0  0    3    4
Fiat 128            32.4   4  78.7  66 4.08 2.200 19.47  1  1    4    1
Toyota Corolla      33.9   4  71.1  65 4.22 1.835 19.90  1  1    4    1
Dodge Challenger    15.5   8 318.0 150 2.76 3.520 16.87  0  0    3    2
Camaro Z28          13.3   8 350.0 245 3.73 3.840 15.41  0  0    3    4
Fiat X1-9           27.3   4  79.0  66 4.08 1.935 18.90  1  1    4    1
Lotus Europa        30.4   4  95.1 113 3.77 1.513 16.90  1  1    5    2
Ferrari Dino        19.7   6 145.0 175 3.62 2.770 15.50  0  1    5    6
Volvo 142E          21.4   4 121.0 109 4.11 2.780 18.60  1  1    4    2
> 
> # 16. Print every 3rd row from the 1st row (1, 4, 7, 10, ...)
> third_rows <- seq(1, num_rows, 3)
> print(mtcars[third_rows, ])
                     mpg cyl  disp  hp drat    wt  qsec vs am gear carb
Mazda RX4           21.0   6 160.0 110 3.90 2.620 16.46  0  1    4    4
Hornet 4 Drive      21.4   6 258.0 110 3.08 3.215 19.44  1  0    3    1
Duster 360          14.3   8 360.0 245 3.21 3.570 15.84  0  0    3    4
Merc 280            19.2   6 167.6 123 3.92 3.440 18.30  1  0    4    4
Merc 450SL          17.3   8 275.8 180 3.07 3.730 17.60  0  0    3    3
Lincoln Continental 10.4   8 460.0 215 3.00 5.424 17.82  0  0    3    4
Honda Civic         30.4   4  75.7  52 4.93 1.615 18.52  1  1    4    2
Dodge Challenger    15.5   8 318.0 150 2.76 3.520 16.87  0  0    3    2
Pontiac Firebird    19.2   8 400.0 175 3.08 3.845 17.05  0  0    3    2
Lotus Europa        30.4   4  95.1 113 3.77 1.513 16.90  1  1    5    2
Maserati Bora       15.0   8 301.0 335 3.54 3.570 14.60  0  1    5    8
> 
> # 17. Print the first row and last row
> print(mtcars[c(1, num_rows), ])
            mpg cyl disp  hp drat   wt  qsec vs am gear carb
Mazda RX4  21.0   6  160 110 3.90 2.62 16.46  0  1    4    4
Volvo 142E 21.4   4  121 109 4.11 2.78 18.60  1  1    4    2
```

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>
> # 18. Print the last 3 rows without using the tail() function
> print(mtcars[(num_rows - 2):num_rows, ])
              mpg cyl disp  hp drat   wt qsec vs am gear carb
Ferrari Dino  19.7   6  145 175 3.62 2.77 15.5  0  1    5    6
Maserati Bora 15.0   8  301 335 3.54 3.57 14.6  0  1    5    8
Volvo 142E    21.4   4  121 109 4.11 2.78 18.6  1  1    4    2
>
> # 19. Print the elements of the 3rd column
> print(mtcars[, 3])
 [1] 160.0 160.0 108.0 258.0 360.0 225.0 360.0 146.7 140.8 167.6 167.6 275.8
[13] 275.8 275.8 472.0 460.0 440.0  78.7  75.7  71.1 120.1 318.0 304.0 350.0
[25] 400.0  79.0 120.3  95.1 351.0 145.0 301.0 121.0
>
> # 20. Print the elements of the column with name "wt"
> print(mtcars[, "wt"])
 [1] 2.620 2.875 2.320 3.215 3.440 3.460 3.570 3.190 3.150 3.440 3.440 4.070
[13] 3.730 3.780 5.250 5.424 5.345 2.200 1.615 1.835 2.465 3.520 3.435 3.840
[25] 3.845 1.935 2.140 1.513 3.170 2.770 3.570 2.780
>
> # 21. Print the elements of columns "mpg" and "qsec"
> print(mtcars[, c("mpg", "qsec")])
                     mpg  qsec
Mazda RX4           21.0 16.46
Mazda RX4 Wag       21.0 17.02
Datsun 710          22.8 18.61
Hornet 4 Drive      21.4 19.44
Hornet Sportabout   18.7 17.02
Valiant             18.1 20.22
Duster 360          14.3 15.84
Merc 240D           24.4 20.00
Merc 230            22.8 22.90
Merc 280            19.2 18.30
Merc 280C           17.8 18.90
Merc 450SE          16.4 17.40
Merc 450SL          17.3 17.60
Merc 450SLC         15.2 18.00
Cadillac Fleetwood  10.4 17.98
Lincoln Continental 10.4 17.82
Chrysler Imperial   14.7 17.42
Fiat 128            32.4 19.47
Honda Civic         30.4 18.52
Toyota Corolla      33.9 19.90
Toyota Corona       21.5 20.01
Dodge Challenger    15.5 16.87
AMC Javelin         15.2 17.30
Camaro Z28          13.3 15.41
Pontiac Firebird    19.2 17.05
Fiat X1-9           27.3 18.90
Porsche 914-2       26.0 16.70
Lotus Europa        30.4 16.90
Ford Pantera L      15.8 14.50
Ferrari Dino        19.7 15.50
Maserati Bora       15.0 14.60
Volvo 142E          21.4 18.60
>
```

```
>
> # 22. Print the first three columns
> print(mtcars[, 1:3])
                     mpg cyl  disp
Mazda RX4           21.0   6 160.0
Mazda RX4 Wag       21.0   6 160.0
Datsun 710          22.8   4 108.0
Hornet 4 Drive      21.4   6 258.0
Hornet Sportabout   18.7   8 360.0
Valiant             18.1   6 225.0
Duster 360          14.3   8 360.0
Merc 240D           24.4   4 146.7
Merc 230            22.8   4 140.8
Merc 280            19.2   6 167.6
Merc 280C           17.8   6 167.6
Merc 450SE          16.4   8 275.8
Merc 450SL          17.3   8 275.8
Merc 450SLC         15.2   8 275.8
Cadillac Fleetwood  10.4   8 472.0
Lincoln Continental 10.4   8 460.0
Chrysler Imperial   14.7   8 440.0
Fiat 128            32.4   4  78.7
Honda Civic         30.4   4  75.7
Toyota Corolla      33.9   4  71.1
Toyota Corona       21.5   4 120.1
Dodge Challenger    15.5   8 318.0
AMC Javelin         15.2   8 304.0
Camaro Z28          13.3   8 350.0
Pontiac Firebird    19.2   8 400.0
Fiat X1-9           27.3   4  79.0
Porsche 914-2       26.0   4 120.3
Lotus Europa        30.4   4  95.1
Ford Pantera L      15.8   8 351.0
Ferrari Dino        19.7   6 145.0
Maserati Bora       15.0   8 301.0
Volvo 142E          21.4   4 121.0
>
> # 23. Print the elements of columns from 5 to 10
> print(mtcars[, 5:10])
                    drat    wt  qsec vs am gear
Mazda RX4           3.90 2.620 16.46  0  1    4
Mazda RX4 Wag       3.90 2.875 17.02  0  1    4
Datsun 710          3.85 2.320 18.61  1  1    4
Hornet 4 Drive      3.08 3.215 19.44  1  0    3
Hornet Sportabout   3.15 3.440 17.02  0  0    3
Valiant             2.76 3.460 20.22  1  0    3
Duster 360          3.21 3.570 15.84  0  0    3
Merc 240D           3.69 3.190 20.00  1  0    4
Merc 230            3.92 3.150 22.90  1  0    4
Merc 280            3.92 3.440 18.30  1  0    4
Merc 280C           3.92 3.440 18.90  1  0    4
Merc 450SE          3.07 4.070 17.40  0  0    3
Merc 450SL          3.07 3.730 17.60  0  0    3
Merc 450SLC         3.07 3.780 18.00  0  0    3
Cadillac Fleetwood  2.93 5.250 17.98  0  0    3
Lincoln Continental 3.00 5.424 17.82  0  0    3
Chrysler Imperial   3.23 5.345 17.42  0  0    3
Fiat 128            4.08 2.200 19.47  1  1    4
Honda Civic         4.93 1.615 18.52  1  1    4
```

```
Toyota Corolla       4.22 1.835 19.90  1  1    4
Toyota Corona        3.70 2.465 20.01  1  0    3
Dodge Challenger     2.76 3.520 16.87  0  0    3
AMC Javelin          3.15 3.435 17.30  0  0    3
Camaro Z28           3.73 3.840 15.41  0  0    3
Pontiac Firebird     3.08 3.845 17.05  0  0    3
Fiat X1-9            4.08 1.935 18.90  1  1    4
Porsche 914-2        4.43 2.140 16.70  0  1    5
Lotus Europa         3.77 1.513 16.90  1  1    5
Ford Pantera L       4.22 3.170 14.50  0  1    5
Ferrari Dino         3.62 2.770 15.50  0  1    5
>
> # 24. Print the elements of columns from 3 to 7, 9, and 11
> print(mtcars[, c(3:7, 9, 11)])
                     disp  hp drat    wt  qsec am carb
Mazda RX4           160.0 110 3.90 2.620 16.46  1    4
Mazda RX4 Wag       160.0 110 3.90 2.875 17.02  1    4
Datsun 710          108.0  93 3.85 2.320 18.61  1    1
Hornet 4 Drive      258.0 110 3.08 3.215 19.44  0    1
Hornet Sportabout   360.0 175 3.15 3.440 17.02  0    2
Valiant             225.0 105 2.76 3.460 20.22  0    1
Duster 360          360.0 245 3.21 3.570 15.84  0    4
Merc 240D           146.7  62 3.69 3.190 20.00  0    2
Merc 230            140.8  95 3.92 3.150 22.90  0    2
Merc 280            167.6 123 3.92 3.440 18.30  0    4
Merc 280C           167.6 123 3.92 3.440 18.90  0    4
Merc 450SE          275.8 180 3.07 4.070 17.40  0    3
Merc 450SL          275.8 180 3.07 3.730 17.60  0    3
Merc 450SLC         275.8 180 3.07 3.780 18.00  0    3
Cadillac Fleetwood  472.0 205 2.93 5.250 17.98  0    4
Lincoln Continental 460.0 215 3.00 5.424 17.82  0    4
Chrysler Imperial   440.0 230 3.23 5.345 17.42  0    4
Fiat 128             78.7  66 4.08 2.200 19.47  1    1
Honda Civic          75.7  52 4.93 1.615 18.52  1    2
Toyota Corolla       71.1  65 4.22 1.835 19.90  1    1
Toyota Corona       120.1  97 3.70 2.465 20.01  0    1
Dodge Challenger    318.0 150 2.76 3.520 16.87  0    2
AMC Javelin         304.0 150 3.15 3.435 17.30  0    2
Camaro Z28          350.0 245 3.73 3.840 15.41  0    4
Pontiac Firebird    400.0 175 3.08 3.845 17.05  0    2
Fiat X1-9            79.0  66 4.08 1.935 18.90  1    1
Porsche 914-2       120.3  91 4.43 2.140 16.70  1    2
Lotus Europa         95.1 113 3.77 1.513 16.90  1    2
Ford Pantera L      351.0 264 4.22 3.170 14.50  1    4
Ferrari Dino        145.0 175 3.62 2.770 15.50  1    6
Maserati Bora       301.0 335 3.54 3.570 14.60  1    8
Volvo 142E          121.0 109 4.11 2.780 18.60  1    2
>
```

```
> # 25. Print all odd indexed columns (1, 3, 5, ...)
> odd_columns <- seq(1, num_columns, 2)
> print(mtcars[, odd_columns])
                     mpg  disp drat  qsec am carb
Mazda RX4           21.0 160.0 3.90 16.46  1    4
Mazda RX4 Wag       21.0 160.0 3.90 17.02  1    4
Datsun 710          22.8 108.0 3.85 18.61  1    1
Hornet 4 Drive      21.4 258.0 3.08 19.44  0    1
Hornet Sportabout   18.7 360.0 3.15 17.02  0    2
Valiant             18.1 225.0 2.76 20.22  0    1
Duster 360          14.3 360.0 3.21 15.84  0    4
Merc 240D           24.4 146.7 3.69 20.00  0    2
Merc 230            22.8 140.8 3.92 22.90  0    2
Merc 280            19.2 167.6 3.92 18.30  0    4
Merc 280C           17.8 167.6 3.92 18.90  0    4
Merc 450SE          16.4 275.8 3.07 17.40  0    3
Merc 450SL          17.3 275.8 3.07 17.60  0    3
Merc 450SLC         15.2 275.8 3.07 18.00  0    3
Cadillac Fleetwood  10.4 472.0 2.93 17.98  0    4
Lincoln Continental 10.4 460.0 3.00 17.82  0    4
Chrysler Imperial   14.7 440.0 3.23 17.42  0    4
Fiat 128            32.4  78.7 4.08 19.47  1    1
Honda Civic         30.4  75.7 4.93 18.52  1    2
Toyota Corolla      33.9  71.1 4.22 19.90  1    1
Toyota Corona       21.5 120.1 3.70 20.01  0    1
Dodge Challenger    15.5 318.0 2.76 16.87  0    2
AMC Javelin         15.2 304.0 3.15 17.30  0    2
Camaro Z28          13.3 350.0 3.73 15.41  0    4
Pontiac Firebird    19.2 400.0 3.08 17.05  0    2
Fiat X1-9           27.3  79.0 4.08 18.90  1    1
Porsche 914-2       26.0 120.3 4.43 16.70  1    2
Lotus Europa        30.4  95.1 3.77 16.90  1    2
Ford Pantera L      15.8 351.0 4.22 14.50  1    4
Ferrari Dino        19.7 145.0 3.62 15.50  1    6
Maserati Bora       15.0 301.0 3.54 14.60  1    8
Volvo 142E          21.4 121.0 4.11 18.60  1    2
>
>
> # 26. Print all even indexed columns (2, 4, 6, ...)
> even_columns <- seq(2, num_columns, 2)
> print(mtcars[, even_columns])
                    cyl  hp    wt vs gear
Mazda RX4             6 110 2.620  0    4
Mazda RX4 Wag         6 110 2.875  0    4
Datsun 710            4  93 2.320  1    4
Hornet 4 Drive        6 110 3.215  1    3
Hornet Sportabout     8 175 3.440  0    3
Valiant               6 105 3.460  1    3
Duster 360            8 245 3.570  0    3
Merc 240D             4  62 3.190  1    4
Merc 230              4  95 3.150  1    4
Merc 280              6 123 3.440  1    4
Merc 280C             6 123 3.440  1    4
Merc 450SE            8 180 4.070  0    3
Merc 450SL            8 180 3.730  0    3
Merc 450SLC           8 180 3.780  0    3
```

```
Cadillac Fleetwood      8 205 5.250  0    3
Lincoln Continental     8 215 5.424  0    3
Chrysler Imperial       8 230 5.345  0    3
Fiat 128                4  66 2.200  1    4
Honda Civic             4  52 1.615  1    4
Toyota Corolla          4  65 1.835  1    4
Toyota Corona           4  97 2.465  1    3
Dodge Challenger        8 150 3.520  0    3
AMC Javelin             8 150 3.435  0    3
Camaro Z28              8 245 3.840  0    3
Pontiac Firebird        8 175 3.845  0    3
Fiat X1-9               4  66 1.935  1    4
Porsche 914-2           4  91 2.140  0    5
Lotus Europa            4 113 1.513  1    5
Ford Pantera L          8 264 3.170  0    5
Ferrari Dino            6 175 2.770  0    5
Maserati Bora           8 335 3.570  0    5
Volvo 142E              4 109 2.780  1    4
>
> # 27. Print every 3rd column from the 1st column (1, 4, 7, 10, ...)
> third_columns <- seq(1, num_columns, 3)
> print(mtcars[, third_columns])
                      mpg  hp  qsec gear
Mazda RX4            21.0 110 16.46    4
Mazda RX4 Wag        21.0 110 17.02    4
Datsun 710           22.8  93 18.61    4
Hornet 4 Drive       21.4 110 19.44    3
Hornet Sportabout    18.7 175 17.02    3
Valiant              18.1 105 20.22    3
Duster 360           14.3 245 15.84    3
Merc 240D            24.4  62 20.00    4
Merc 230             22.8  95 22.90    4
Merc 280             19.2 123 18.30    4
Merc 280C            17.8 123 18.90    4
Merc 450SE           16.4 180 17.40    3
Merc 450SL           17.3 180 17.60    3
Merc 450SLC          15.2 180 18.00    3
Cadillac Fleetwood   10.4 205 17.98    3
Lincoln Continental  10.4 215 17.82    3
Chrysler Imperial    14.7 230 17.42    3
Fiat 128             32.4  66 19.47    4
Honda Civic          30.4  52 18.52    4
Toyota Corolla       33.9  65 19.90    4
Toyota Corona        21.5  97 20.01    3
Dodge Challenger     15.5 150 16.87    3
AMC Javelin          15.2 150 17.30    3
Camaro Z28           13.3 245 15.41    3
Pontiac Firebird     19.2 175 17.05    3
Fiat X1-9            27.3  66 18.90    4
Porsche 914-2        26.0  91 16.70    5
Lotus Europa         30.4 113 16.90    5
Ford Pantera L       15.8 264 14.50    5
Ferrari Dino         19.7 175 15.50    5
Maserati Bora        15.0 335 14.60    5
Volvo 142E           21.4 109 18.60    4
>
> # 28. Print the first column and last column
> print(mtcars[, c(1, num_columns)])
                      mpg carb
Mazda RX4            21.0    4
```

```
Mazda RX4              21.0    4
Mazda RX4 Wag          21.0    4
Datsun 710             22.8    1
Hornet 4 Drive         21.4    1
Hornet Sportabout      18.7    2
Valiant                18.1    1
Duster 360             14.3    4
Merc 240D              24.4    2
Merc 230               22.8    2
Merc 280               19.2    4
Merc 280C              17.8    4
Merc 450SE             16.4    3
Merc 450SL             17.3    3
Merc 450SLC            15.2    3
Cadillac Fleetwood     10.4    4
Lincoln Continental    10.4    4
Chrysler Imperial      14.7    4
Fiat 128               32.4    1
Honda Civic            30.4    2
Toyota Corolla         33.9    1
Toyota Corona          21.5    1
Dodge Challenger       15.5    2
AMC Javelin            15.2    2
Camaro Z28             13.3    4
Pontiac Firebird       19.2    2
Fiat X1-9              27.3    1
Porsche 914-2          26.0    2
Lotus Europa           30.4    2
Ford Pantera L         15.8    4
Ferrari Dino           19.7    6
Maserati Bora          15.0    8
Volvo 142E             21.4    2
>
>
> # 29. Print the last 3 columns
> print(mtcars[, (num_columns - 2):num_columns])
                     am gear carb
Mazda RX4             1    4    4
Mazda RX4 Wag         1    4    4
Datsun 710            1    4    1
Hornet 4 Drive        0    3    1
Hornet Sportabout     0    3    2
Valiant               0    3    1
Duster 360            0    3    4
Merc 240D             0    4    2
Merc 230              0    4    2
Merc 280              0    4    4
Merc 280C             0    4    4
Merc 450SE            0    3    3
Merc 450SL            0    3    3
Merc 450SLC           0    3    3
```

```
Cadillac Fleetwood     0    3    4
Lincoln Continental    0    3    4
Chrysler Imperial      0    3    4
Fiat 128               1    4    1
Honda Civic            1    4    2
Toyota Corolla         1    4    1
Toyota Corona          0    3    1
Dodge Challenger       0    3    2
AMC Javelin            0    3    2
Camaro Z28             0    3    4
Pontiac Firebird       0    3    2
Fiat X1-9              1    4    1
Porsche 914-2          1    5    2
Lotus Europa           1    5    2
Ford Pantera L         1    5    4
Ferrari Dino           1    5    6
Maserati Bora          1    5    8
Volvo 142E             1    4    2
>
> # 30. Print the first row and 2nd and 3rd column
> print(mtcars[1, c(2, 3)])
          cyl disp
Mazda RX4   6  160
>
> # 31. Print the first two rows and the second and third column
> print(mtcars[1:2, c(2, 3)])
             cyl disp
Mazda RX4      6  160
Mazda RX4 Wag  6  160
>
> # 32. Print the element at the 2nd row, 3rd column
> print(mtcars[2, 3])
[1] 160
>
> # 33. Print all the rows having "mpg" value greater than 14
> print(mtcars[mtcars$mpg > 14, ])
                   mpg cyl  disp  hp drat    wt  qsec vs am gear carb
Mazda RX4         21.0   6 160.0 110 3.90 2.620 16.46  0  1    4    4
Mazda RX4 Wag     21.0   6 160.0 110 3.90 2.875 17.02  0  1    4    4
Datsun 710        22.8   4 108.0  93 3.85 2.320 18.61  1  1    4    1
Hornet 4 Drive    21.4   6 258.0 110 3.08 3.215 19.44  1  0    3    1
Hornet Sportabout 18.7   8 360.0 175 3.15 3.440 17.02  0  0    3    2
Valiant           18.1   6 225.0 105 2.76 3.460 20.22  1  0    3    1
Duster 360        14.3   8 360.0 245 3.21 3.570 15.84  0  0    3    4
Merc 240D         24.4   4 146.7  62 3.69 3.190 20.00  1  0    4    2
Merc 230          22.8   4 140.8  95 3.92 3.150 22.90  1  0    4    2
Merc 280          19.2   6 167.6 123 3.92 3.440 18.30  1  0    4    4
Merc 280C         17.8   6 167.6 123 3.92 3.440 18.90  1  0    4    4
Merc 450SE        16.4   8 275.8 180 3.07 4.070 17.40  0  0    3    3
Merc 450SL        17.3   8 275.8 180 3.07 3.730 17.60  0  0    3    3
Merc 450SLC       15.2   8 275.8 180 3.07 3.780 18.00  0  0    3    3
Chrysler Imperial 14.7   8 440.0 230 3.23 5.345 17.42  0  0    3    4
Fiat 128          32.4   4  78.7  66 4.08 2.200 19.47  1  1    4    1
Honda Civic       30.4   4  75.7  52 4.93 1.615 18.52  1  1    4    2
```

```
Toyota Corolla      33.9   4   71.1   65 4.22 1.835 19.90   1  1     4     1
Toyota Corona       21.5   4 120.1    97 3.70 2.465 20.01   1  0     3     1
Dodge Challenger    15.5   8 318.0   150 2.76 3.520 16.87   0  0     3     2
AMC Javelin         15.2   8 304.0   150 3.15 3.435 17.30   0  0     3     2
Pontiac Firebird    19.2   8 400.0   175 3.08 3.845 17.05   0  0     3     2
Fiat X1-9           27.3   4   79.0   66 4.08 1.935 18.90   1  1     4     1
Porsche 914-2       26.0   4 120.3    91 4.43 2.140 16.70   0  1     5     2
Lotus Europa        30.4   4   95.1  113 3.77 1.513 16.90   1  1     5     2
Ford Pantera L      15.8   8 351.0   264 4.22 3.170 14.50   0  1     5     4
Ferrari Dino        19.7   6 145.0   175 3.62 2.770 15.50   0  1     5     6
Maserati Bora       15.0   8 301.0   335 3.54 3.570 14.60   0  1     5     8
Volvo 142E          21.4   4 121.0   109 4.11 2.780 18.60   1  1     4     2
> # 34. Print all the rows having "hp" value less than 100
> print(mtcars[mtcars$hp < 100, ])
                mpg cyl  disp hp drat    wt  qsec vs am gear carb
Datsun 710     22.8   4 108.0 93 3.85 2.320 18.61  1  1    4    1
Merc 240D      24.4   4 146.7 62 3.69 3.190 20.00  1  0    4    2
Merc 230       22.8   4 140.8 95 3.92 3.150 22.90  1  0    4    2
Fiat 128       32.4   4  78.7 66 4.08 2.200 19.47  1  1    4    1
Honda Civic    30.4   4  75.7 52 4.93 1.615 18.52  1  1    4    2
Toyota Corolla 33.9   4  71.1 65 4.22 1.835 19.90  1  1    4    1
Toyota Corona  21.5   4 120.1 97 3.70 2.465 20.01  1  0    3    1
Fiat X1-9      27.3   4  79.0 66 4.08 1.935 18.90  1  1    4    1
Porsche 914-2  26.0   4 120.3 91 4.43 2.140 16.70  0  1    5    2
>
> # 35. Print all the rows having "disp" value between 100 and 200
> print(mtcars[mtcars$disp > 100 & mtcars$disp < 200, ])
                 mpg cyl  disp  hp drat    wt  qsec vs am gear carb
Mazda RX4       21.0   6 160.0 110 3.90 2.620 16.46  0  1    4    4
Mazda RX4 Wag   21.0   6 160.0 110 3.90 2.875 17.02  0  1    4    4
Datsun 710      22.8   4 108.0  93 3.85 2.320 18.61  1  1    4    1
Merc 240D       24.4   4 146.7  62 3.69 3.190 20.00  1  0    4    2
Merc 230        22.8   4 140.8  95 3.92 3.150 22.90  1  0    4    2
Merc 280        19.2   6 167.6 123 3.92 3.440 18.30  1  0    4    4
Merc 280C       17.8   6 167.6 123 3.92 3.440 18.90  1  0    4    4
Toyota Corona   21.5   4 120.1  97 3.70 2.465 20.01  1  0    3    1
Porsche 914-2   26.0   4 120.3  91 4.43 2.140 16.70  0  1    5    2
Ferrari Dino    19.7   6 145.0 175 3.62 2.770 15.50  0  1    5    6
Volvo 142E      21.4   4 121.0 109 4.11 2.780 18.60  1  1    4    2
>
> # 35. Use head() and tail() commands to display sample observations of mtc
> head(mtcars)
                   mpg cyl disp  hp drat    wt  qsec vs am gear carb
Mazda RX4         21.0   6  160 110 3.90 2.620 16.46  0  1    4    4
Mazda RX4 Wag     21.0   6  160 110 3.90 2.875 17.02  0  1    4    4
Datsun 710        22.8   4  108  93 3.85 2.320 18.61  1  1    4    1
Hornet 4 Drive    21.4   6  258 110 3.08 3.215 19.44  1  0    3    1
Hornet Sportabout 18.7   8  360 175 3.15 3.440 17.02  0  0    3    2
Valiant           18.1   6  225 105 2.76 3.460 20.22  1  0    3    1
```

```
> tail(mtcars)
               mpg cyl  disp  hp drat    wt qsec vs am gear carb
Porsche 914-2  26.0   4 120.3  91 4.43 2.140 16.7  0  1    5    2
Lotus Europa   30.4   4  95.1 113 3.77 1.513 16.9  1  1    5    2
Ford Pantera L 15.8   8 351.0 264 4.22 3.170 14.5  0  1    5    4
Ferrari Dino   19.7   6 145.0 175 3.62 2.770 15.5  0  1    5    6
Maserati Bora  15.0   8 301.0 335 3.54 3.570 14.6  0  1    5    8
Volvo 142E     21.4   4 121.0 109 4.11 2.780 18.6  1  1    4    2
>
> # 36. Use head() command to print the first 10 observations.
> head(mtcars, 10)
                   mpg cyl  disp  hp drat    wt  qsec vs am gear carb
Mazda RX4         21.0   6 160.0 110 3.90 2.620 16.46  0  1    4    4
Mazda RX4 Wag     21.0   6 160.0 110 3.90 2.875 17.02  0  1    4    4
Datsun 710        22.8   4 108.0  93 3.85 2.320 18.61  1  1    4    1
Hornet 4 Drive    21.4   6 258.0 110 3.08 3.215 19.44  1  0    3    1
Hornet Sportabout 18.7   8 360.0 175 3.15 3.440 17.02  0  0    3    2
Valiant           18.1   6 225.0 105 2.76 3.460 20.22  1  0    3    1
Duster 360        14.3   8 360.0 245 3.21 3.570 15.84  0  0    3    4
Merc 240D         24.4   4 146.7  62 3.69 3.190 20.00  1  0    4    2
Merc 230          22.8   4 140.8  95 3.92 3.150 22.90  1  0    4    2
Merc 280          19.2   6 167.6 123 3.92 3.440 18.30  1  0    4    4
>
> # 37. Use tail() command to print the last 15 observations.
> tail(mtcars, 15)
                   mpg cyl  disp  hp drat    wt  qsec vs am gear carb
Fiat 128          32.4   4  78.7  66 4.08 2.200 19.47  1  1    4    1
Honda Civic       30.4   4  75.7  52 4.93 1.615 18.52  1  1    4    2
Toyota Corolla    33.9   4  71.1  65 4.22 1.835 19.90  1  1    4    1
Toyota Corona     21.5   4 120.1  97 3.70 2.465 20.01  1  0    3    1
Dodge Challenger  15.5   8 318.0 150 2.76 3.520 16.87  0  0    3    2
AMC Javelin       15.2   8 304.0 150 3.15 3.435 17.30  0  0    3    2
Camaro Z28        13.3   8 350.0 245 3.73 3.840 15.41  0  0    3    4
Pontiac Firebird  19.2   8 400.0 175 3.08 3.845 17.05  0  0    3    2
Fiat X1-9         27.3   4  79.0  66 4.08 1.935 18.90  1  1    4    1
Porsche 914-2     26.0   4 120.3  91 4.43 2.140 16.70  0  1    5    2
Lotus Europa      30.4   4  95.1 113 3.77 1.513 16.90  1  1    5    2
Ford Pantera L    15.8   8 351.0 264 4.22 3.170 14.50  0  1    5    4
Ferrari Dino      19.7   6 145.0 175 3.62 2.770 15.50  0  1    5    6
Maserati Bora     15.0   8 301.0 335 3.54 3.570 14.60  0  1    5    8
Volvo 142E        21.4   4 121.0 109 4.11 2.780 18.60  1  1    4    2
> |
```

SORTING :-

Sort the observations of the dataset "mtcars" in increasing order based on the values in the column "mpg"

```
sorted_mpg <- mtcars[order(mtcars$mpg), ]
sorted_mpg
```

```
> sorted_mpg <- mtcars[order(mtcars$mpg), ]
> sorted_mpg
                     mpg cyl  disp  hp drat    wt  qsec vs am gear carb
Cadillac Fleetwood  10.4   8 472.0 205 2.93 5.250 17.98  0  0    3    4
Lincoln Continental 10.4   8 460.0 215 3.00 5.424 17.82  0  0    3    4
Camaro Z28          13.3   8 350.0 245 3.73 3.840 15.41  0  0    3    4
Duster 360          14.3   8 360.0 245 3.21 3.570 15.84  0  0    3    4
Chrysler Imperial   14.7   8 440.0 230 3.23 5.345 17.42  0  0    3    4
Maserati Bora       15.0   8 301.0 335 3.54 3.570 14.60  0  1    5    8
Merc 450SLC         15.2   8 275.8 180 3.07 3.780 18.00  0  0    3    3
AMC Javelin         15.2   8 304.0 150 3.15 3.435 17.30  0  0    3    2
Dodge Challenger    15.5   8 318.0 150 2.76 3.520 16.87  0  0    3    2
Ford Pantera L      15.8   8 351.0 264 4.22 3.170 14.50  0  1    5    4
Merc 450SE          16.4   8 275.8 180 3.07 4.070 17.40  0  0    3    3
Merc 450SL          17.3   8 275.8 180 3.07 3.730 17.60  0  0    3    3
Merc 280C           17.8   6 167.6 123 3.92 3.440 18.90  1  0    4    4
Valiant             18.1   6 225.0 105 2.76 3.460 20.22  1  0    3    1
Hornet Sportabout   18.7   8 360.0 175 3.15 3.440 17.02  0  0    3    2
Merc 280            19.2   6 167.6 123 3.92 3.440 18.30  1  0    4    4
Pontiac Firebird    19.2   8 400.0 175 3.08 3.845 17.05  0  0    3    2
Ferrari Dino        19.7   6 145.0 175 3.62 2.770 15.50  0  1    5    6
Mazda RX4           21.0   6 160.0 110 3.90 2.620 16.46  0  1    4    4
Mazda RX4 Wag       21.0   6 160.0 110 3.90 2.875 17.02  0  1    4    4
Hornet 4 Drive      21.4   6 258.0 110 3.08 3.215 19.44  1  0    3    1
Volvo 142E          21.4   4 121.0 109 4.11 2.780 18.60  1  1    4    2
Toyota Corona       21.5   4 120.1  97 3.70 2.465 20.01  1  0    3    1
Datsun 710          22.8   4 108.0  93 3.85 2.320 18.61  1  1    4    1
Merc 230            22.8   4 140.8  95 3.92 3.150 22.90  1  0    4    2
Merc 240D           24.4   4 146.7  62 3.69 3.190 20.00  1  0    4    2
Porsche 914-2       26.0   4 120.3  91 4.43 2.140 16.70  0  1    5    2
Fiat X1-9           27.3   4  79.0  66 4.08 1.935 18.90  1  1    4    1
Honda Civic         30.4   4  75.7  52 4.93 1.615 18.52  1  1    4    2
Lotus Europa        30.4   4  95.1 113 3.77 1.513 16.90  1  1    5    2
Fiat 128            32.4   4  78.7  66 4.08 2.200 19.47  1  1    4    1
Toyota Corolla      33.9   4  71.1  65 4.22 1.835 19.90  1  1    4    1
> |
```

Sort the observations of the dataset "mtcars" in decreasing order based on the values in the column "cyl"

```
R R Console

> sorted_cyl <- mtcars[order(-mtcars$cyl), ]
> sorted_cyl
                     mpg cyl  disp  hp drat    wt  qsec vs am gear carb
Hornet Sportabout   18.7   8 360.0 175 3.15 3.440 17.02  0  0    3    2
Duster 360          14.3   8 360.0 245 3.21 3.570 15.84  0  0    3    4
Merc 450SE          16.4   8 275.8 180 3.07 4.070 17.40  0  0    3    3
Merc 450SL          17.3   8 275.8 180 3.07 3.730 17.60  0  0    3    3
Merc 450SLC         15.2   8 275.8 180 3.07 3.780 18.00  0  0    3    3
Cadillac Fleetwood  10.4   8 472.0 205 2.93 5.250 17.98  0  0    3    4
Lincoln Continental 10.4   8 460.0 215 3.00 5.424 17.82  0  0    3    4
Chrysler Imperial   14.7   8 440.0 230 3.23 5.345 17.42  0  0    3    4
Dodge Challenger    15.5   8 318.0 150 2.76 3.520 16.87  0  0    3    2
AMC Javelin         15.2   8 304.0 150 3.15 3.435 17.30  0  0    3    2
Camaro Z28          13.3   8 350.0 245 3.73 3.840 15.41  0  0    3    4
Pontiac Firebird    19.2   8 400.0 175 3.08 3.845 17.05  0  0    3    2
Ford Pantera L      15.8   8 351.0 264 4.22 3.170 14.50  0  1    5    4
Maserati Bora       15.0   8 301.0 335 3.54 3.570 14.60  0  1    5    8
Mazda RX4           21.0   6 160.0 110 3.90 2.620 16.46  0  1    4    4
Mazda RX4 Wag       21.0   6 160.0 110 3.90 2.875 17.02  0  1    4    4
Hornet 4 Drive      21.4   6 258.0 110 3.08 3.215 19.44  1  0    3    1
Valiant             18.1   6 225.0 105 2.76 3.460 20.22  1  0    3    1
Merc 280            19.2   6 167.6 123 3.92 3.440 18.30  1  0    4    4
Merc 280C           17.8   6 167.6 123 3.92 3.440 18.90  1  0    4    4
Ferrari Dino        19.7   6 145.0 175 3.62 2.770 15.50  0  1    5    6
Datsun 710          22.8   4 108.0  93 3.85 2.320 18.61  1  1    4    1
Merc 240D           24.4   4 146.7  62 3.69 3.190 20.00  1  0    4    2
Merc 230            22.8   4 140.8  95 3.92 3.150 22.90  1  0    4    2
Fiat 128            32.4   4  78.7  66 4.08 2.200 19.47  1  1    4    1
Honda Civic         30.4   4  75.7  52 4.93 1.615 18.52  1  1    4    2
Toyota Corolla      33.9   4  71.1  65 4.22 1.835 19.90  1  1    4    1
Toyota Corona       21.5   4 120.1  97 3.70 2.465 20.01  1  0    3    1
Fiat X1-9           27.3   4  79.0  66 4.08 1.935 18.90  1  1    4    1
Porsche 914-2       26.0   4 120.3  91 4.43 2.140 16.70  0  1    5    2
Lotus Europa        30.4   4  95.1 113 3.77 1.513 16.90  1  1    5    2
Volvo 142E          21.4   4 121.0 109 4.11 2.780 18.60  1  1    4    2
>
```

Sort the observations of the dataset "mtcars" in increasing order based on the values in both the "mpg" and "cyl" columns

```
R R Console

> sorted_mpg_cyl <- mtcars[order(mtcars$mpg, mtcars$cyl), ]
> sorted_mpg_cyl
                     mpg cyl  disp  hp drat    wt  qsec vs am gear carb
Cadillac Fleetwood  10.4   8 472.0 205 2.93 5.250 17.98  0  0    3    4
Lincoln Continental 10.4   8 460.0 215 3.00 5.424 17.82  0  0    3    4
Camaro Z28          13.3   8 350.0 245 3.73 3.840 15.41  0  0    3    4
Duster 360          14.3   8 360.0 245 3.21 3.570 15.84  0  0    3    4
Chrysler Imperial   14.7   8 440.0 230 3.23 5.345 17.42  0  0    3    4
Maserati Bora       15.0   8 301.0 335 3.54 3.570 14.60  0  1    5    8
Merc 450SLC         15.2   8 275.8 180 3.07 3.780 18.00  0  0    3    3
AMC Javelin         15.2   8 304.0 150 3.15 3.435 17.30  0  0    3    2
Dodge Challenger    15.5   8 318.0 150 2.76 3.520 16.87  0  0    3    2
Ford Pantera L      15.8   8 351.0 264 4.22 3.170 14.50  0  1    5    4
Merc 450SE          16.4   8 275.8 180 3.07 4.070 17.40  0  0    3    3
Merc 450SL          17.3   8 275.8 180 3.07 3.730 17.60  0  0    3    3
Merc 280C           17.8   6 167.6 123 3.92 3.440 18.90  1  0    4    4
Valiant             18.1   6 225.0 105 2.76 3.460 20.22  1  0    3    1
Hornet Sportabout   18.7   8 360.0 175 3.15 3.440 17.02  0  0    3    2
Merc 280            19.2   6 167.6 123 3.92 3.440 18.30  1  0    4    4
Pontiac Firebird    19.2   8 400.0 175 3.08 3.845 17.05  0  0    3    2
Ferrari Dino        19.7   6 145.0 175 3.62 2.770 15.50  0  1    5    6
Mazda RX4           21.0   6 160.0 110 3.90 2.620 16.46  0  1    4    4
Mazda RX4 Wag       21.0   6 160.0 110 3.90 2.875 17.02  0  1    4    4
Volvo 142E          21.4   4 121.0 109 4.11 2.780 18.60  1  1    4    2
Hornet 4 Drive      21.4   6 258.0 110 3.08 3.215 19.44  1  0    3    1
Toyota Corona       21.5   4 120.1  97 3.70 2.465 20.01  1  0    3    1
Datsun 710          22.8   4 108.0  93 3.85 2.320 18.61  1  1    4    1
Merc 230            22.8   4 140.8  95 3.92 3.150 22.90  1  0    4    2
Merc 240D           24.4   4 146.7  62 3.69 3.190 20.00  1  0    4    2
Porsche 914-2       26.0   4 120.3  91 4.43 2.140 16.70  0  1    5    2
Fiat X1-9           27.3   4  79.0  66 4.08 1.935 18.90  1  1    4    1
Honda Civic         30.4   4  75.7  52 4.93 1.615 18.52  1  1    4    2
Lotus Europa        30.4   4  95.1 113 3.77 1.513 16.90  1  1    5    2
Fiat 128            32.4   4  78.7  66 4.08 2.200 19.47  1  1    4    1
Toyota Corolla      33.9   4  71.1  65 4.22 1.835 19.90  1  1    4    1
>
```

Sort the observations of the dataset "mtcars" by column "mpg" in increasing order and column "cyl" in decreasing order

```
R Console
> sorted_mpg_cyl_mix <- mtcars[order(mtcars$mpg, -mtcars$cyl), ]
> sorted_mpg_cyl_mix
                    mpg cyl  disp  hp drat    wt  qsec vs am gear carb
Cadillac Fleetwood 10.4   8 472.0 205 2.93 5.250 17.98  0  0    3    4
Lincoln Continental 10.4  8 460.0 215 3.00 5.424 17.82  0  0    3    4
Camaro Z28         13.3   8 350.0 245 3.73 3.840 15.41  0  0    3    4
Duster 360         14.3   8 360.0 245 3.21 3.570 15.84  0  0    3    4
Chrysler Imperial  14.7   8 440.0 230 3.23 5.345 17.42  0  0    3    4
Maserati Bora      15.0   8 301.0 335 3.54 3.570 14.60  0  1    5    8
Merc 450SLC        15.2   8 275.8 180 3.07 3.780 18.00  0  0    3    3
AMC Javelin        15.2   8 304.0 150 3.15 3.435 17.30  0  0    3    2
Dodge Challenger   15.5   8 318.0 150 2.76 3.520 16.87  0  0    3    2
Ford Pantera L     15.8   8 351.0 264 4.22 3.170 14.50  0  1    5    4
Merc 450SE         16.4   8 275.8 180 3.07 4.070 17.40  0  0    3    3
Merc 450SL         17.3   8 275.8 180 3.07 3.730 17.60  0  0    3    3
Merc 280C          17.8   6 167.6 123 3.92 3.440 18.90  1  0    4    4
Valiant            18.1   6 225.0 105 2.76 3.460 20.22  1  0    3    1
Hornet Sportabout  18.7   8 360.0 175 3.15 3.440 17.02  0  0    3    2
Pontiac Firebird   19.2   8 400.0 175 3.08 3.845 17.05  0  0    3    2
Merc 280           19.2   6 167.6 123 3.92 3.440 18.30  1  0    4    4
Ferrari Dino       19.7   6 145.0 175 3.62 2.770 15.50  0  1    5    6
Mazda RX4          21.0   6 160.0 110 3.90 2.620 16.46  0  1    4    4
Mazda RX4 Wag      21.0   6 160.0 110 3.90 2.875 17.02  0  1    4    4
Hornet 4 Drive     21.4   6 258.0 110 3.08 3.215 19.44  1  0    3    1
Volvo 142E         21.4   4 121.0 109 4.11 2.780 18.60  1  1    4    2
Toyota Corona      21.5   4 120.1  97 3.70 2.465 20.01  1  0    3    1
Datsun 710         22.8   4 108.0  93 3.85 2.320 18.61  1  1    4    1
Merc 230           22.8   4 140.8  95 3.92 3.150 22.90  1  0    4    2
Merc 240D          24.4   4 146.7  62 3.69 3.190 20.00  1  0    4    2
Porsche 914-2      26.0   4 120.3  91 4.43 2.140 16.70  0  1    5    2
Fiat X1-9          27.3   4  79.0  66 4.08 1.935 18.90  1  1    4    1
Honda Civic        30.4   4  75.7  52 4.93 1.615 18.52  1  1    4    2
Lotus Europa       30.4   4  95.1 113 3.77 1.513 16.90  1  1    5    2
Fiat 128           32.4   4  78.7  66 4.08 2.200 19.47  1  1    4    1
Toyota Corolla     33.9   4  71.1  65 4.22 1.835 19.90  1  1    4    1
> |
```