hw 02

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Q1 a)

```
mtcars[mtcars$cyl < 6, ]</pre>
##
                  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
## Merc 240D
                  24.4
                         4 146.7
                                 62 3.69 3.190 20.00
                                                                    2
## Merc 230
                  22.8
                         4 140.8
                                 95 3.92 3.150 22.90
## Fiat 128
                  32.4
                         4 78.7
                                  66 4.08 2.200 19.47
                                                          1
                                                       1
## Honda Civic
                  30.4
                        4 75.7
                                 52 4.93 1.615 18.52
                                  65 4.22 1.835 19.90
                                                                    1
## Toyota Corolla 33.9
                        4 71.1
## Toyota Corona 21.5
                         4 120.1
                                 97 3.70 2.465 20.01
## Fiat X1-9
                  27.3
                         4 79.0
                                 66 4.08 1.935 18.90
                                                                    1
                 26.0
                        4 120.3 91 4.43 2.140 16.70
## Porsche 914-2
                                                                    2
## Lotus Europa
                  30.4
                        4 95.1 113 3.77 1.513 16.90
                  21.4
## Volvo 142E
                         4 121.0 109 4.11 2.780 18.60
```

Q1 b)

mtcars[-(1:3),]

```
mpg cyl disp hp drat
                                                  wt qsec vs am gear carb
                       21.4
                              6 258.0 110 3.08 3.215 19.44
## Hornet 4 Drive
                              8 360.0 175 3.15 3.440 17.02
                                                                          2
## Hornet Sportabout
                       18.7
## Valiant
                       18.1
                              6 225.0 105 2.76 3.460 20.22
## Duster 360
                       14.3
                              8 360.0 245 3.21 3.570 15.84
                                                                          2
## Merc 240D
                       24.4
                              4 146.7 62 3.69 3.190 20.00
                                                                     4
                                                               0
## Merc 230
                       22.8
                              4 140.8 95 3.92 3.150 22.90
                                                                          2
                              6 167.6 123 3.92 3.440 18.30
## Merc 280
                       19.2
## Merc 280C
                       17.8
                              6 167.6 123 3.92 3.440 18.90
## Merc 450SE
                       16.4
                              8 275.8 180 3.07 4.070 17.40
                                                                          3
                       17.3
                              8 275.8 180 3.07 3.730 17.60
                                                                          3
## Merc 450SL
## Merc 450SLC
                       15.2
                              8 275.8 180 3.07 3.780 18.00
## Cadillac Fleetwood 10.4
                              8 472.0 205 2.93 5.250 17.98
                                                            Ω
## Lincoln Continental 10.4
                              8 460.0 215 3.00 5.424 17.82
                              8 440.0 230 3.23 5.345 17.42
                                                                          4
## Chrysler Imperial
                       14.7
## Fiat 128
                       32.4
                              4 78.7
                                       66 4.08 2.200 19.47
                       30.4
                                       52 4.93 1.615 18.52 1
## Honda Civic
                              4 75.7
```

```
## Toyota Corolla
                       33.9
                              4 71.1 65 4.22 1.835 19.90
                              4 120.1 97 3.70 2.465 20.01
                                                                          1
## Toyota Corona
                       21.5
                                                                          2
## Dodge Challenger
                       15.5
                              8 318.0 150 2.76 3.520 16.87
                                                                          2
## AMC Javelin
                       15.2
                              8 304.0 150 3.15 3.435 17.30
## Camaro Z28
                       13.3
                              8 350.0 245 3.73 3.840 15.41
                                                                          4
## Pontiac Firebird
                       19.2
                              8 400.0 175 3.08 3.845 17.05
                                                                          2
                                                             0
                                                                0
## Fiat X1-9
                       27.3
                              4 79.0 66 4.08 1.935 18.90
                              4 120.3 91 4.43 2.140 16.70
                                                                          2
## Porsche 914-2
                       26.0
                                                             0
                                                               1
                                                                     5
## Lotus Europa
                       30.4
                              4 95.1 113 3.77 1.513 16.90
                                                             1
                                                               1
                                                                     5
                                                                          2
                                                                     5
                                                                          4
## Ford Pantera L
                       15.8
                              8 351.0 264 4.22 3.170 14.50
                                                               1
## Ferrari Dino
                       19.7
                              6 145.0 175 3.62 2.770 15.50
## Maserati Bora
                       15.0
                              8 301.0 335 3.54 3.570 14.60
                                                                     5
                                                                          8
                                                             0
                                                               1
                              4 121.0 109 4.11 2.780 18.60
                                                                          2
## Volvo 142E
                       21.4
```

Q1 c)

```
mtcars[mtcars$cyl == 8, ]
```

```
##
                        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
## Duster 360
                              8 360.0 245 3.21 3.570 15.84
                                                                     3
                                                                          4
                       14.3
                                                             0
                                                                0
## Merc 450SE
                       16.4
                              8 275.8 180 3.07 4.070 17.40
## Merc 450SL
                       17.3
                              8 275.8 180 3.07 3.730 17.60
                                                                          3
                                                             0
                                                                Ω
## Merc 450SLC
                       15.2
                              8 275.8 180 3.07 3.780 18.00
                                                                          3
## Cadillac Fleetwood 10.4
                              8 472.0 205 2.93 5.250 17.98
                                                                     3
                                                                          4
                                                                Ω
                              8 460.0 215 3.00 5.424 17.82
## Lincoln Continental 10.4
                              8 440.0 230 3.23 5.345 17.42
## Chrysler Imperial
                       14.7
                                                                     3
                                                                          4
## Dodge Challenger
                       15.5
                              8 318.0 150 2.76 3.520 16.87
                                                                          2
## AMC Javelin
                                                                     3
                                                                          2
                       15.2
                              8 304.0 150 3.15 3.435 17.30
                                                             0
                                                                0
## Camaro Z28
                       13.3
                              8 350.0 245 3.73 3.840 15.41
                                                             0
                                                                          2
## Pontiac Firebird
                       19.2
                              8 400.0 175 3.08 3.845 17.05
                                                             0
                                                                0
                                                                     3
## 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
```

Q1 d)

```
mtcars[mtcars$cyl == 4 | mtcars$cyl == 6, ]
```

```
##
                   mpg cyl disp hp drat
                                             wt qsec vs am gear carb
                         6 160.0 110 3.90 2.620 16.46
                                                                     4
## Mazda RX4
                  21.0
                                                       0
                                                          1
## Mazda RX4 Wag
                  21.0
                         6 160.0 110 3.90 2.875 17.02
## Datsun 710
                  22.8
                         4 108.0 93 3.85 2.320 18.61
                                                                     1
## Hornet 4 Drive 21.4
                         6 258.0 110 3.08 3.215 19.44
                                                                     1
## Valiant
                  18.1
                         6 225.0 105 2.76 3.460 20.22
                                                          0
                                                                     1
                                                       1
## Merc 240D
                  24.4
                         4 146.7 62 3.69 3.190 20.00
                  22.8
## Merc 230
                         4 140.8 95 3.92 3.150 22.90
                                                                     2
                                                       1
                                                          0
                  19.2
                         6 167.6 123 3.92 3.440 18.30
                                                                     4
## Merc 280
                                                       1
                                                          0
                                                                     4
## Merc 280C
                  17.8
                         6 167.6 123 3.92 3.440 18.90
                                                       1
                                                          0
## Fiat 128
                  32.4
                         4 78.7 66 4.08 2.200 19.47
```

```
## Honda Civic
                30.4
                       4 75.7 52 4.93 1.615 18.52 1 1
## Toyota Corolla 33.9
                      4 71.1 65 4.22 1.835 19.90
                                                                1
                                                   1
                                                      1
## Toyota Corona 21.5
                       4 120.1 97 3.70 2.465 20.01
                                                                1
## Fiat X1-9
                27.3
                      4 79.0 66 4.08 1.935 18.90
                                                                1
## Porsche 914-2 26.0
                      4 120.3 91 4.43 2.140 16.70 0 1
                                                                2
## Lotus Europa
                30.4
                      4 95.1 113 3.77 1.513 16.90
                                                                2
                                                  1 1
## Ferrari Dino
                19.7
                       6 145.0 175 3.62 2.770 15.50 0 1
                                                                6
                21.4 4 121.0 109 4.11 2.780 18.60 1 1
                                                                2
## Volvo 142E
```

$\mathbf{Q2}$

When we execute x[NA], it returns five missing values because there are no elements in x that satisfy the condition of being missing.

Q3 mtcars[1:15]

Above line of code returns an error as we are not specifying the row. Syntax should be x[1,1] mtcars[1:5,] is different than mtcars[1:5] as we are specifying both row and column.

$\mathbf{Q4}$

```
x = matrix(c(1:3, NA, 5:7, NA, NA), nrow = 3)
#Here we are creating a matrix of three rows with nultiple values and three of the cells
# contains "NA" as values.
        [,1] [,2] [,3]
## [1,]
               NA
           1
## [2,]
           2
                5
                    NA
## [3,]
           3
                6
                    NA
x[is.na(x)] = 0
\# is na(x) is a logical matrix which looks for a missing values and returns TRUE or FALSE. x[is.na(x)]
# replaces all those NA to "O".
х
##
        [,1] [,2] [,3]
## [1,]
                0
                     7
           1
## [2,]
           2
                5
                     0
## [3,]
           3
                     0
```

Q_5

```
#loading the dataframe
data("mtcars")

#checking the dataframe
head(mtcars)
```

```
##
                    mpg cyl disp hp drat
                                             wt qsec vs am gear carb
                    21.0 6 160 110 3.90 2.620 16.46
## Mazda RX4
                                                        0
## Mazda RX4 Wag
                    21.0 6 160 110 3.90 2.875 17.02
                    22.8 4 108 93 3.85 2.320 18.61 1 1
## Datsun 710
                                                                     1
## Hornet 4 Drive
                    21.4 6 258 110 3.08 3.215 19.44
## Hornet Sportabout 18.7 8 360 175 3.15 3.440 17.02 0 0
                                                                     2
                    18.1 6 225 105 2.76 3.460 20.22 1 0
#now we need to add another column for the dataframe which has a
#different category of milage for each car model.
#For that we will make use of ifelse function to first to segregate the data into 4 type.
milage_cat <- ifelse(mtcars$mpg < 16.0, "Low",
                    ifelse(mtcars$mpg < 21.0, "Low intermediate",</pre>
                           ifelse(mtcars$mpg < 26.0, "Intermidate_High", "High" )))</pre>
#checking the new column data
head(milage_cat, n=10)
## [1] "Intermidate_High" "Intermidate_High" "Intermidate_High" "Intermidate_High"
   [5] "Low_intermediate" "Low_intermediate" "Low"
                                                                "Intermidate_High"
   [9] "Intermidate_High" "Low_intermediate"
#adding the data to datafrane as a new column at the end
mtcars$mpg_2 <- milage_cat</pre>
#checking the dataframe to ensure the column and category makes sense
head(mtcars, n=32)
##
                       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
## Mazda RX4 Wag
                    21.0 6 160.0 110 3.90 2.875 17.02 0
                                                                  Δ
                                                        1
## Datsun 710
                    22.8 4 108.0 93 3.85 2.320 18.61 1 1
## Hornet 4 Drive 21.4 6 258.0 110 3.08 3.215 19.44 1 0
## Hornet Sportabout 18.7 8 360.0 175 3.15 3.440 17.02 0 0
## Valiant
                   18.1 6 225.0 105 2.76 3.460 20.22 1 0
                   14.3 8 360.0 245 3.21 3.570 15.84 0 0
## Duster 360
                    24.4 4 146.7 62 3.69 3.190 20.00 1 0
## Merc 240D
                                                             4
                                                                  2
## Merc 230
                   22.8 4 140.8 95 3.92 3.150 22.90 1
                                                        0
                                                                  2
## Merc 280
                   19.2 6 167.6 123 3.92 3.440 18.30 1 0
## Merc 280C
                   17.8 6 167.6 123 3.92 3.440 18.90 1 0
                   16.4 8 275.8 180 3.07 4.070 17.40 0 0
## Merc 450SE
                                                             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
## Cadillac Fleetwood 10.4 8 472.0 205 2.93 5.250 17.98 0 0
                                                                  4
## Lincoln Continental 10.4 8 460.0 215 3.00 5.424 17.82 0
                                                         0
                                                                  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
                    30.4 4 75.7 52 4.93 1.615 18.52 1 1 4
## Honda Civic
## Toyota Corolla
                  33.9 4 71.1 65 4.22 1.000 10.1
21.5 4 120.1 97 3.70 2.465 20.01 1 0
                    33.9 4 71.1 65 4.22 1.835 19.90 1 1
                                                             4
                                                                  1
                                                             3
                                                                  1
## Toyota Corona
## Dodge Challenger 15.5 8 318.0 150 2.76 3.520 16.87 0 0 3
                                                                  2
                   15.2 8 304.0 150 3.15 3.435 17.30 0 0
## AMC Javelin
                                                                  2
```

```
8 350.0 245 3.73 3.840 15.41
## Camaro Z28
                       13.3
## Pontiac Firebird
                       19.2
                               8 400.0 175 3.08 3.845 17.05
                                                                           2
## Fiat X1-9
                               4 79.0 66 4.08 1.935 18.90
                       27.3
                                                                           1
## Porsche 914-2
                       26.0
                               4 120.3 91 4.43 2.140 16.70
                                                                           2
                                                                           2
## Lotus Europa
                       30.4
                               4 95.1 113 3.77 1.513 16.90
                                                                      5
## Ford Pantera L
                       15.8
                               8 351.0 264 4.22 3.170 14.50
                                                                      5
                                                                           4
## Ferrari Dino
                       19.7
                               6 145.0 175 3.62 2.770 15.50
## Maserati Bora
                       15.0
                               8 301.0 335 3.54 3.570 14.60
                                                              0
                                                                      5
                                                                           8
## Volvo 142E
                       21.4
                               4 121.0 109 4.11 2.780 18.60 1
                                                                           2
##
                                   mpg_2
                       Intermidate_High
## Mazda RX4
## Mazda RX4 Wag
                       Intermidate_High
## Datsun 710
                       Intermidate_High
## Hornet 4 Drive
                       Intermidate_High
## Hornet Sportabout
                       Low_intermediate
## Valiant
                       Low_intermediate
## Duster 360
                                     Low
## Merc 240D
                       Intermidate High
## Merc 230
                       Intermidate_High
## Merc 280
                       Low intermediate
## Merc 280C
                       Low_intermediate
## Merc 450SE
                       Low_intermediate
## Merc 450SL
                       Low_intermediate
## Merc 450SLC
## Cadillac Fleetwood
                                     Low
## Lincoln Continental
                                     Low
## Chrysler Imperial
                                     Low
## Fiat 128
                                    High
## Honda Civic
                                    High
## Toyota Corolla
                                    High
## Toyota Corona
                       Intermidate_High
## Dodge Challenger
                                     Low
## AMC Javelin
                                     Low
## Camaro Z28
                                     Low
## Pontiac Firebird
                       Low_intermediate
## Fiat X1-9
                                    High
## Porsche 914-2
                                    High
## Lotus Europa
                                    High
## Ford Pantera L
                                     Low
## Ferrari Dino
                       Low_intermediate
## Maserati Bora
## Volvo 142E
                       Intermidate_High
```