DATA MANIPULATION

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library(tidyverse)

## Warning: package 'tidyverse' was built under R version 3.6.3

## -- Attaching packages --------------------------------------------------------------------------------------------------------------------- tidyverse 1.3.0 --

## v ggplot2 3.3.2 v purrr 0.3.4  
## v tibble 3.0.3 v dplyr 1.0.1  
## v tidyr 1.1.1 v stringr 1.4.0  
## v readr 1.3.1 v forcats 0.5.0

## Warning: package 'ggplot2' was built under R version 3.6.3

## Warning: package 'tibble' was built under R version 3.6.3

## Warning: package 'tidyr' was built under R version 3.6.3

## Warning: package 'readr' was built under R version 3.6.3

## Warning: package 'purrr' was built under R version 3.6.3

## Warning: package 'dplyr' was built under R version 3.6.3

## Warning: package 'stringr' was built under R version 3.6.3

## Warning: package 'forcats' was built under R version 3.6.3

## -- Conflicts ------------------------------------------------------------------------------------------------------------------------ tidyverse\_conflicts() --  
## x dplyr::filter() masks stats::filter()  
## x dplyr::lag() masks stats::lag()

library(ggplot2)

## mtcars

data(mtcars)  
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 ...

summary(mtcars)

## mpg cyl disp hp   
## Min. :10.40 Min. :4.000 Min. : 71.1 Min. : 52.0   
## 1st Qu.:15.43 1st Qu.:4.000 1st Qu.:120.8 1st Qu.: 96.5   
## Median :19.20 Median :6.000 Median :196.3 Median :123.0   
## Mean :20.09 Mean :6.188 Mean :230.7 Mean :146.7   
## 3rd Qu.:22.80 3rd Qu.:8.000 3rd Qu.:326.0 3rd Qu.:180.0   
## Max. :33.90 Max. :8.000 Max. :472.0 Max. :335.0   
## drat wt qsec vs   
## Min. :2.760 Min. :1.513 Min. :14.50 Min. :0.0000   
## 1st Qu.:3.080 1st Qu.:2.581 1st Qu.:16.89 1st Qu.:0.0000   
## Median :3.695 Median :3.325 Median :17.71 Median :0.0000   
## Mean :3.597 Mean :3.217 Mean :17.85 Mean :0.4375   
## 3rd Qu.:3.920 3rd Qu.:3.610 3rd Qu.:18.90 3rd Qu.:1.0000   
## Max. :4.930 Max. :5.424 Max. :22.90 Max. :1.0000   
## am gear carb   
## Min. :0.0000 Min. :3.000 Min. :1.000   
## 1st Qu.:0.0000 1st Qu.:3.000 1st Qu.:2.000   
## Median :0.0000 Median :4.000 Median :2.000   
## Mean :0.4062 Mean :3.688 Mean :2.812   
## 3rd Qu.:1.0000 3rd Qu.:4.000 3rd Qu.:4.000   
## Max. :1.0000 Max. :5.000 Max. :8.000

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

## Filtering rows using filter.

filter(mtcars,cyl==4)

## 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  
## 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

filter(mtcars,gear==4)

## 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  
## 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  
## Fiat X1-9 27.3 4 79.0 66 4.08 1.935 18.90 1 1 4 1  
## Volvo 142E 21.4 4 121.0 109 4.11 2.780 18.60 1 1 4 2

filter(mtcars,vs==0)

## 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  
## 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  
## 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  
## 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

filter(mtcars,am==1)

## 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  
## 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  
## 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

## Using Logical Operator

filter(mtcars,gear==4|gear==5)

## 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  
## 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  
## 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

filter(mtcars,cyl==4|cyl==6)

## 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  
## 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 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  
## 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  
## 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

#Using %in% operator  
filter(mtcars,gear%in%c(4,5))

## 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  
## 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  
## 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

filter(mtcars,cyl%in%c(4,6))

## 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  
## 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 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  
## 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  
## 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

#Using "not" Operator  
filter(mtcars,gear!=4)

## mpg cyl disp hp drat wt qsec vs am gear carb  
## 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 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  
## 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  
## 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

filter(mtcars,cyl!=6)

## 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  
## 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 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 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  
## 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  
## 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

#Using <=,>= operator  
filter(mtcars,gear>=4|cyl<=4)

## 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  
## 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  
## 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

## Arranging the rows with arrange()

arrange(mtcars,gear)

## mpg cyl disp hp drat wt qsec vs am gear carb  
## 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 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  
## 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  
## 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  
## 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  
## Fiat X1-9 27.3 4 79.0 66 4.08 1.935 18.90 1 1 4 1  
## Volvo 142E 21.4 4 121.0 109 4.11 2.780 18.60 1 1 4 2  
## 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

arrange(mtcars,gear,cyl)

## mpg cyl disp hp drat wt qsec vs am gear carb  
## Toyota Corona 21.5 4 120.1 97 3.70 2.465 20.01 1 0 3 1  
## 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  
## 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  
## 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  
## Fiat X1-9 27.3 4 79.0 66 4.08 1.935 18.90 1 1 4 1  
## Volvo 142E 21.4 4 121.0 109 4.11 2.780 18.60 1 1 4 2  
## 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  
## 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  
## 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  
## Ferrari Dino 19.7 6 145.0 175 3.62 2.770 15.50 0 1 5 6  
## 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

arrange(mtcars,gear,cyl,carb)

## mpg cyl disp hp drat wt qsec vs am gear carb  
## Toyota Corona 21.5 4 120.1 97 3.70 2.465 20.01 1 0 3 1  
## 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  
## Hornet Sportabout 18.7 8 360.0 175 3.15 3.440 17.02 0 0 3 2  
## 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  
## 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  
## Duster 360 14.3 8 360.0 245 3.21 3.570 15.84 0 0 3 4  
## 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  
## Camaro Z28 13.3 8 350.0 245 3.73 3.840 15.41 0 0 3 4  
## Datsun 710 22.8 4 108.0 93 3.85 2.320 18.61 1 1 4 1  
## 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  
## Fiat X1-9 27.3 4 79.0 66 4.08 1.935 18.90 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  
## Honda Civic 30.4 4 75.7 52 4.93 1.615 18.52 1 1 4 2  
## Volvo 142E 21.4 4 121.0 109 4.11 2.780 18.60 1 1 4 2  
## 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  
## 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  
## 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  
## Ferrari Dino 19.7 6 145.0 175 3.62 2.770 15.50 0 1 5 6  
## 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

#in descending order  
arrange(mtcars,desc(gear))

## mpg cyl disp hp drat wt qsec vs am gear carb  
## Porsche 914-2 26.0 4 120.3 91 4.43 2.140 16.70 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  
## 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  
## 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  
## Fiat X1-9 27.3 4 79.0 66 4.08 1.935 18.90 1 1 4 1  
## 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  
## 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 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  
## 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

arrange(mtcars,desc(gear,cyl))

## mpg cyl disp hp drat wt qsec vs am gear carb  
## Porsche 914-2 26.0 4 120.3 91 4.43 2.140 16.70 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  
## 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  
## 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  
## Fiat X1-9 27.3 4 79.0 66 4.08 1.935 18.90 1 1 4 1  
## 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  
## 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 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  
## 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

arrange(mtcars,desc(gear,cyl,carb))

## mpg cyl disp hp drat wt qsec vs am gear carb  
## Porsche 914-2 26.0 4 120.3 91 4.43 2.140 16.70 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  
## 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  
## 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  
## Fiat X1-9 27.3 4 79.0 66 4.08 1.935 18.90 1 1 4 1  
## 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  
## 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 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  
## 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

## Selecting Columns using select()

select(mtcars,cyl,gear,carb)

## cyl gear carb  
## Mazda RX4 6 4 4  
## Mazda RX4 Wag 6 4 4  
## Datsun 710 4 4 1  
## Hornet 4 Drive 6 3 1  
## Hornet Sportabout 8 3 2  
## Valiant 6 3 1  
## Duster 360 8 3 4  
## Merc 240D 4 4 2  
## Merc 230 4 4 2  
## Merc 280 6 4 4  
## Merc 280C 6 4 4  
## Merc 450SE 8 3 3  
## Merc 450SL 8 3 3  
## Merc 450SLC 8 3 3  
## Cadillac Fleetwood 8 3 4  
## Lincoln Continental 8 3 4  
## Chrysler Imperial 8 3 4  
## Fiat 128 4 4 1  
## Honda Civic 4 4 2  
## Toyota Corolla 4 4 1  
## Toyota Corona 4 3 1  
## Dodge Challenger 8 3 2  
## AMC Javelin 8 3 2  
## Camaro Z28 8 3 4  
## Pontiac Firebird 8 3 2  
## Fiat X1-9 4 4 1  
## Porsche 914-2 4 5 2  
## Lotus Europa 4 5 2  
## Ford Pantera L 8 5 4  
## Ferrari Dino 6 5 6  
## Maserati Bora 8 5 8  
## Volvo 142E 4 4 2

#Selecting all columns between two columns  
select(mtcars,cyl:carb)

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

#selecting columns ecxepting fews  
select(mtcars,-cyl)

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

select(mtcars,-(cyl:carb))

## mpg  
## Mazda RX4 21.0  
## Mazda RX4 Wag 21.0  
## Datsun 710 22.8  
## Hornet 4 Drive 21.4  
## Hornet Sportabout 18.7  
## Valiant 18.1  
## Duster 360 14.3  
## Merc 240D 24.4  
## Merc 230 22.8  
## Merc 280 19.2  
## Merc 280C 17.8  
## Merc 450SE 16.4  
## Merc 450SL 17.3  
## Merc 450SLC 15.2  
## Cadillac Fleetwood 10.4  
## Lincoln Continental 10.4  
## Chrysler Imperial 14.7  
## Fiat 128 32.4  
## Honda Civic 30.4  
## Toyota Corolla 33.9  
## Toyota Corona 21.5  
## Dodge Challenger 15.5  
## AMC Javelin 15.2  
## Camaro Z28 13.3  
## Pontiac Firebird 19.2  
## Fiat X1-9 27.3  
## Porsche 914-2 26.0  
## Lotus Europa 30.4  
## Ford Pantera L 15.8  
## Ferrari Dino 19.7  
## Maserati Bora 15.0  
## Volvo 142E 21.4

#selecting few and then using everything() to select remaining columns in a sequence manner  
select(mtcars,cyl,gear,everything())

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

## Renaming Variables using rename

rename(mtcars,horsepower=hp)

## mpg cyl disp horsepower 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  
## 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  
## 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

## Adding new variables using mutate()

mutate(mtcars,nv=wt+mpg)

## mpg cyl disp hp drat wt qsec vs am gear carb nv  
## 1 21.0 6 160.0 110 3.90 2.620 16.46 0 1 4 4 23.620  
## 2 21.0 6 160.0 110 3.90 2.875 17.02 0 1 4 4 23.875  
## 3 22.8 4 108.0 93 3.85 2.320 18.61 1 1 4 1 25.120  
## 4 21.4 6 258.0 110 3.08 3.215 19.44 1 0 3 1 24.615  
## 5 18.7 8 360.0 175 3.15 3.440 17.02 0 0 3 2 22.140  
## 6 18.1 6 225.0 105 2.76 3.460 20.22 1 0 3 1 21.560  
## 7 14.3 8 360.0 245 3.21 3.570 15.84 0 0 3 4 17.870  
## 8 24.4 4 146.7 62 3.69 3.190 20.00 1 0 4 2 27.590  
## 9 22.8 4 140.8 95 3.92 3.150 22.90 1 0 4 2 25.950  
## 10 19.2 6 167.6 123 3.92 3.440 18.30 1 0 4 4 22.640  
## 11 17.8 6 167.6 123 3.92 3.440 18.90 1 0 4 4 21.240  
## 12 16.4 8 275.8 180 3.07 4.070 17.40 0 0 3 3 20.470  
## 13 17.3 8 275.8 180 3.07 3.730 17.60 0 0 3 3 21.030  
## 14 15.2 8 275.8 180 3.07 3.780 18.00 0 0 3 3 18.980  
## 15 10.4 8 472.0 205 2.93 5.250 17.98 0 0 3 4 15.650  
## 16 10.4 8 460.0 215 3.00 5.424 17.82 0 0 3 4 15.824  
## 17 14.7 8 440.0 230 3.23 5.345 17.42 0 0 3 4 20.045  
## 18 32.4 4 78.7 66 4.08 2.200 19.47 1 1 4 1 34.600  
## 19 30.4 4 75.7 52 4.93 1.615 18.52 1 1 4 2 32.015  
## 20 33.9 4 71.1 65 4.22 1.835 19.90 1 1 4 1 35.735  
## 21 21.5 4 120.1 97 3.70 2.465 20.01 1 0 3 1 23.965  
## 22 15.5 8 318.0 150 2.76 3.520 16.87 0 0 3 2 19.020  
## 23 15.2 8 304.0 150 3.15 3.435 17.30 0 0 3 2 18.635  
## 24 13.3 8 350.0 245 3.73 3.840 15.41 0 0 3 4 17.140  
## 25 19.2 8 400.0 175 3.08 3.845 17.05 0 0 3 2 23.045  
## 26 27.3 4 79.0 66 4.08 1.935 18.90 1 1 4 1 29.235  
## 27 26.0 4 120.3 91 4.43 2.140 16.70 0 1 5 2 28.140  
## 28 30.4 4 95.1 113 3.77 1.513 16.90 1 1 5 2 31.913  
## 29 15.8 8 351.0 264 4.22 3.170 14.50 0 1 5 4 18.970  
## 30 19.7 6 145.0 175 3.62 2.770 15.50 0 1 5 6 22.470  
## 31 15.0 8 301.0 335 3.54 3.570 14.60 0 1 5 8 18.570  
## 32 21.4 4 121.0 109 4.11 2.780 18.60 1 1 4 2 24.180

## Using Summarise

summarise(mtcars,mean\_gear=mean(gear,na.rm = TRUE),mean\_hp=mean(hp,na.rm = TRUE),mean\_cyl=mean(cyl,na.rm = TRUE))

## mean\_gear mean\_hp mean\_cyl  
## 1 3.6875 146.6875 6.1875

#Summarising and using group\_by  
by\_cyl<-group\_by(mtcars,cyl)  
summarise(by\_cyl,mean\_cyl=mean(cyl,na.rm = TRUE))

## `summarise()` ungrouping output (override with `.groups` argument)

## # A tibble: 3 x 2  
## cyl mean\_cyl  
## <dbl> <dbl>  
## 1 4 4  
## 2 6 6  
## 3 8 8

#Or simply putting the value of by\_cyl in summarise by grouping  
summarise(group\_by(mtcars,cyl),mean\_cyl=mean(cyl,na.rm = TRUE))

## `summarise()` ungrouping output (override with `.groups` argument)

## # A tibble: 3 x 2  
## cyl mean\_cyl  
## <dbl> <dbl>  
## 1 4 4  
## 2 6 6  
## 3 8 8

## Combining multiple operations using pipe function

mtcars%>%select(cyl,gear)

## cyl gear  
## Mazda RX4 6 4  
## Mazda RX4 Wag 6 4  
## Datsun 710 4 4  
## Hornet 4 Drive 6 3  
## Hornet Sportabout 8 3  
## Valiant 6 3  
## Duster 360 8 3  
## Merc 240D 4 4  
## Merc 230 4 4  
## Merc 280 6 4  
## Merc 280C 6 4  
## Merc 450SE 8 3  
## Merc 450SL 8 3  
## Merc 450SLC 8 3  
## Cadillac Fleetwood 8 3  
## Lincoln Continental 8 3  
## Chrysler Imperial 8 3  
## Fiat 128 4 4  
## Honda Civic 4 4  
## Toyota Corolla 4 4  
## Toyota Corona 4 3  
## Dodge Challenger 8 3  
## AMC Javelin 8 3  
## Camaro Z28 8 3  
## Pontiac Firebird 8 3  
## Fiat X1-9 4 4  
## Porsche 914-2 4 5  
## Lotus Europa 4 5  
## Ford Pantera L 8 5  
## Ferrari Dino 6 5  
## Maserati Bora 8 5  
## Volvo 142E 4 4

mtcars%>%select(cyl,gear)%>%filter(cyl==4,gear==4)

## cyl gear  
## Datsun 710 4 4  
## Merc 240D 4 4  
## Merc 230 4 4  
## Fiat 128 4 4  
## Honda Civic 4 4  
## Toyota Corolla 4 4  
## Fiat X1-9 4 4  
## Volvo 142E 4 4

mtcars%>%select(cyl,gear)%>%filter(cyl>4,gear>=4)%>%summarise(mean(cyl,na.rm = TRUE),mean(gear,na.rm = TRUE))

## mean(cyl, na.rm = TRUE) mean(gear, na.rm = TRUE)  
## 1 6.571429 4.428571

#othe example  
mtcars%>%filter(cyl==4)

## 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  
## 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

mtcars%>%filter(cyl==4)%>%filter(vs==1)

## 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  
## 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

mtcars%>%filter(cyl==4)%>%filter(vs==1)%>%filter(gear==4)

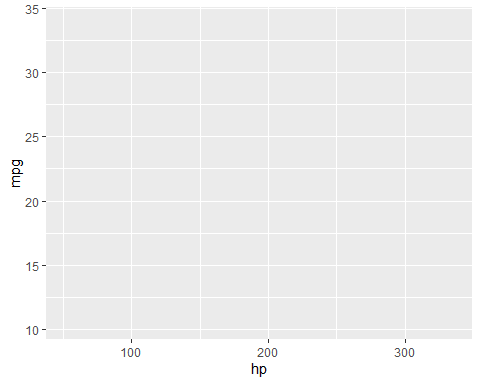
## mpg cyl disp hp drat wt qsec vs am gear carb  
## Datsun 710 22.8 4 108.0 93 3.85 2.320 18.61 1 1 4 1  
## Merc 240D 24.4 4 146.7 62 3.69 3.190 20.00 1 0 4 2  
## Merc 230 22.8 4 140.8 95 3.92 3.150 22.90 1 0 4 2  
## Fiat 128 32.4 4 78.7 66 4.08 2.200 19.47 1 1 4 1  
## Honda Civic 30.4 4 75.7 52 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  
## Fiat X1-9 27.3 4 79.0 66 4.08 1.935 18.90 1 1 4 1  
## Volvo 142E 21.4 4 121.0 109 4.11 2.780 18.60 1 1 4 2

mtcars%>%filter(cyl==4)%>%filter(vs==1)%>%filter(gear==4)%>%select(cyl,vs,gear)

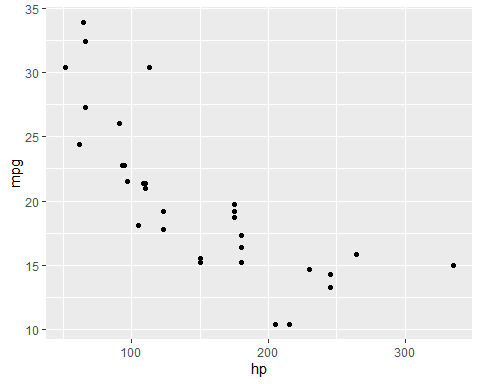
## cyl vs gear  
## Datsun 710 4 1 4  
## Merc 240D 4 1 4  
## Merc 230 4 1 4  
## Fiat 128 4 1 4  
## Honda Civic 4 1 4  
## Toyota Corolla 4 1 4  
## Fiat X1-9 4 1 4  
## Volvo 142E 4 1 4

## Showing the graphs of few variables to show the relationships between them.

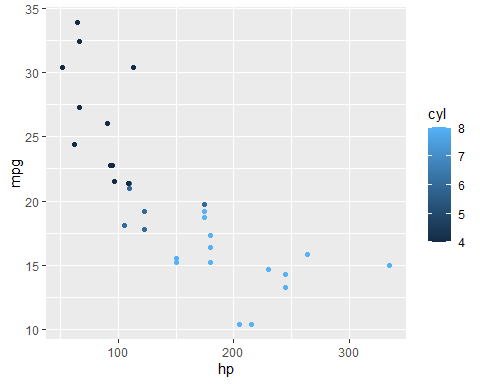
ggplot(data = mtcars,aes(y=mpg,x=hp))



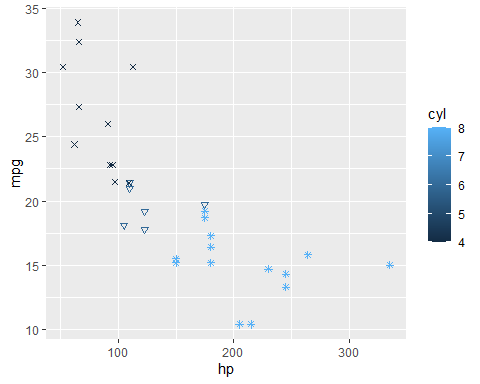
ggplot(data = mtcars,aes(y=mpg,x=hp))+geom\_point()



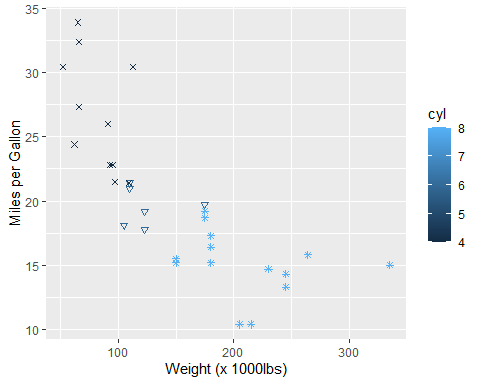
ggplot(data = mtcars,aes(y= mpg,x=hp,col=cyl))+geom\_point()



ggplot(data = mtcars,aes(y=mpg,x=hp,col=cyl,shape=cyl))+geom\_point()+scale\_shape\_identity()

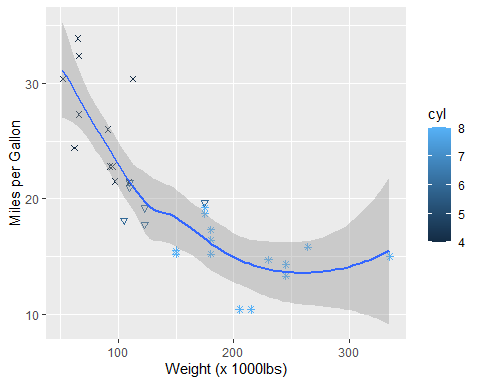


ggplot(data = mtcars,aes(y=mpg,x=hp,col=cyl,shape=cyl))+geom\_point()+scale\_shape\_identity() + xlab('Weight (x 1000lbs)') + ylab('Miles per Gallon')



ggplot(data = mtcars,aes(y=mpg,x=hp,col=cyl,shape=cyl))+geom\_point()+scale\_shape\_identity() + xlab('Weight (x 1000lbs)') + ylab('Miles per Gallon') + geom\_smooth()

## `geom\_smooth()` using method = 'loess' and formula 'y ~ x'



## THE END