Initial data analysis

```
myCars <- mtcars
myCars
```

```
##                      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
## 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
```

Step 1: what is the highest hp

1. What is the highest hp

```
 max(myCars$hp)
```

```
## [1] 335
```

2. Which car has the highest hp

```
myCars[myCars$hp == max(myCars$hp),]
```

```
##               mpg cyl disp  hp drat   wt qsec vs am gear carb
## Maserati Bora  15   8  301 335 3.54 3.57 14.6  0  1    5    8
```

Step 2: Explore mpg

3. What is the highest mpg?

```
max(myCars$mpg)
```

```
## [1] 33.9
```

4. Which car has the highest mpg

```
myCars[myCars$mpg ==max(myCars$mpg),]
```

```
##                 mpg cyl disp hp drat    wt qsec vs am gear carb
## Toyota Corolla 33.9   4 71.1 65 4.22 1.835 19.9  1  1    4    1
```

5. Create a sorted dataframe, based on mpg

```
sortedmpg <- myCars[order(myCars$mpg),]
sortedmpg
```

```
##                      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
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## 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
```

Step 3: Which car has the "best" combination of mpg and hp

6. What logic did you Use?

I decided I would define efficeny as the best combination of mpg/hp.

```
myCars$efficency <- myCars$mpg/myCars$hp
```

7. Which car?

```
myCars[myCars$efficency ==max(myCars$efficency),]
```

```
##              mpg cyl disp hp drat    wt  qsec vs am gear carb efficency
## Honda Civic 30.4   4 75.7 52 4.93 1.615 18.52  1  1    4    2 0.5846154
```

Step 4: Which car has the best car combination of mpg and hp, where mpg and hp must be given equal weight?

```
  scale(myCars$hp)
```

```
##               [,1]
##  [1,] -0.53509284
##  [2,] -0.53509284
##  [3,] -0.78304046
##  [4,] -0.53509284
##  [5,]  0.41294217
##  [6,] -0.60801861
##  [7,]  1.43390296
```

```
##  [8,] -1.23518023
##  [9,] -0.75387015
## [10,] -0.34548584
## [11,] -0.34548584
## [12,]  0.48586794
## [13,]  0.48586794
## [14,]  0.48586794
## [15,]  0.85049680
## [16,]  0.99634834
## [17,]  1.21512565
## [18,] -1.17683962
## [19,] -1.38103178
## [20,] -1.19142477
## [21,] -0.72469984
## [22,]  0.04831332
## [23,]  0.04831332
## [24,]  1.43390296
## [25,]  0.41294217
## [26,] -1.17683962
## [27,] -0.81221077
## [28,] -0.49133738
## [29,]  1.71102089
## [30,]  0.41294217
## [31,]  2.74656682
## [32,] -0.54967799
## attr(,"scaled:center")
## [1] 146.6875
## attr(,"scaled:scale")
## [1] 68.56287
```

```
  scale(myCars$mpg)
```

```
##              [,1]
##  [1,]  0.15088482
##  [2,]  0.15088482
##  [3,]  0.44954345
##  [4,]  0.21725341
##  [5,] -0.23073453
##  [6,] -0.33028740
##  [7,] -0.96078893
##  [8,]  0.71501778
##  [9,]  0.44954345
## [10,] -0.14777380
## [11,] -0.38006384
## [12,] -0.61235388
## [13,] -0.46302456
## [14,] -0.81145962
## [15,] -1.60788262
## [16,] -1.60788262
## [17,] -0.89442035
## [18,]  2.04238943
## [19,]  1.71054652
## [20,]  2.29127162
## [21,]  0.23384555
```

```
## [22,] -0.76168319
## [23,] -0.81145962
## [24,] -1.12671039
## [25,] -0.14777380
## [26,]  1.19619000
## [27,]  0.98049211
## [28,]  1.71054652
## [29,] -0.71190675
## [30,] -0.06481307
## [31,] -0.84464392
## [32,]  0.21725341
## attr(,"scaled:center")
## [1] 20.09062
## attr(,"scaled:scale")
## [1] 6.026948
```

```r
myCars$combo <- scale(myCars$hp)+scale(myCars$mpg)
myCars[myCars$combo ==max(myCars$combo),]
```

```
##               mpg cyl disp  hp drat   wt qsec vs am gear carb  efficency
## Maserati Bora  15   8  301 335 3.54 3.57 14.6  0  1    5    8 0.04477612
##                  combo
## Maserati Bora 1.901923
```