Assignment 1 Group 5

title: “Assignment 1” author: “Group 5” output: pdf_document: default —

Load dataset

```
Car.Sales.1 <- read.csv("~/R/AutomobileSales.csv")
```

Introduction

We have a car sales dataset which we have found from Kaggle.com. We will be studying and performing analysis using the R programming. Our analysis will consist of all the requirements mentioned in the assignment.

List Variables

```
ls(Car.Sales.1)
```

```
##  [1] "Curb_weight"          "Engine_size"          "Fuel_capacity"
##  [4] "Fuel_efficiency"      "Horsepower"           "Latest_Launch"
##  [7] "Length"               "Manufacturer"         "Model"
## [10] "Power_perf_factor"    "Price_in_thousands"   "Sales_in_thousands"
## [13] "Vehicle_type"         "Wheelbase"            "Width"
## [16] "X__year_resale_value"
```

Print Structure

```
str(Car.Sales.1)
```

```
## 'data.frame':    157 obs. of  16 variables:
##  $ Manufacturer        : chr  "Acura" "Acura" "Acura" "Acura" ...
##  $ Model               : chr  "Integra" "TL" "CL" "RL" ...
##  $ Sales_in_thousands  : num  16.92 39.38 14.11 8.59 20.4 ...
##  $ X__year_resale_value: num  16.4 19.9 18.2 29.7 22.3 ...
##  $ Vehicle_type        : chr  "Passenger" "Passenger" "Passenger" "Passenger" ...
##  $ Price_in_thousands  : num  21.5 28.4 0 42 24 ...
##  $ Engine_size         : num  1.8 3.2 3.2 3.5 1.8 2.8 4.2 2.5 2.8 2.8 ...
##  $ Horsepower          : int  140 225 225 210 150 200 310 170 193 193 ...
##  $ Wheelbase           : num  101 108 107 115 103 ...
##  $ Width               : num  67.3 70.3 70.6 71.4 68.2 76.1 74 68.4 68.5 70.9 ...
```

```
##  $ Length              : num  172 193 192 197 178 ...
##  $ Curb_weight         : num  2.64 3.52 3.47 3.85 3 ...
##  $ Fuel_capacity       : num  13.2 17.2 17.2 18 16.4 18.5 23.7 16.6 16.6 18.5 ...
##  $ Fuel_efficiency     : int  28 25 26 22 27 22 21 26 24 25 ...
##  $ Latest_Launch       : chr  "02-02-12" "06-03-11" "01-04-12" "03-10-11" ...
##  $ Power_perf_factor   : num  58.3 91.4 NA 91.4 62.8 ...
```

Print the top 15 rows

```
head(Car.Sales.1, 15)
```

```
##    Manufacturer       Model Sales_in_thousands X__year_resale_value
## 1         Acura     Integra             16.919                16.360
## 2         Acura          TL             39.384                19.875
## 3         Acura          CL             14.114                18.225
## 4         Acura          RL              8.588                29.725
## 5          Audi          A4             20.397                22.255
## 6          Audi          A6             18.780                23.555
## 7          Audi          A8              1.380                39.000
## 8           BMW        323i             19.747                    NA
## 9           BMW        328i              9.231                28.675
## 10          BMW        528i             17.527                36.125
## 11        Buick     Century             91.561                12.475
## 12        Buick       Regal             39.350                13.740
## 13        Buick Park Avenue             27.851                20.190
## 14        Buick     LeSabre             83.257                13.360
## 15     Cadillac     DeVille             63.729                22.525
##    Vehicle_type Price_in_thousands Engine_size Horsepower Wheelbase Width
## 1     Passenger             21.500         1.8        140     101.2  67.3
## 2     Passenger             28.400         3.2        225     108.1  70.3
## 3     Passenger              0.000         3.2        225     106.9  70.6
## 4     Passenger             42.000         3.5        210     114.6  71.4
## 5     Passenger             23.990         1.8        150     102.6  68.2
## 6     Passenger             33.950         2.8        200     108.7  76.1
## 7     Passenger             62.000         4.2        310     113.0  74.0
## 8     Passenger             26.990         2.5        170     107.3  68.4
## 9     Passenger             33.400         2.8        193     107.3  68.5
## 10    Passenger             38.900         2.8        193     111.4  70.9
## 11    Passenger             21.975         3.1        175     109.0  72.7
## 12    Passenger             25.300         3.8        240     109.0  72.7
## 13    Passenger             31.965         3.8        205     113.8  74.7
## 14    Passenger             27.885         3.8        205     112.2  73.5
## 15    Passenger             39.895         4.6        275     115.3  74.5
##    Length Curb_weight Fuel_capacity Fuel_efficiency Latest_Launch
## 1   172.4       2.639          13.2              28      02-02-12
## 2   192.9       3.517          17.2              25      06-03-11
## 3   192.0       3.470          17.2              26      01-04-12
## 4   196.6       3.850          18.0              22      03-10-11
## 5   178.0       2.998          16.4              27      10-08-11
## 6   192.0       3.561          18.5              22      08-09-11
## 7   198.2       3.902          23.7              21     2/27/2012
## 8   176.0       3.179          16.6              26     6/28/2011
```

```
## 9   176.0       3.197          16.6              24     1/29/2012
## 10  188.0       3.472          18.5              25      04-04-11
## 11  194.6       3.368          17.5              25      11-02-11
## 12  196.2       3.543          17.5              23      09-03-11
## 13  206.8       3.778          18.5              24     3/23/2012
## 14  200.0       3.591          17.5              25     7/23/2011
## 15  207.2       3.978          18.5              22     2/23/2012
##    Power_perf_factor
## 1           58.28015
## 2           91.37078
## 3                 NA
## 4           91.38978
## 5           62.77764
## 6           84.56511
## 7          134.65686
## 8           71.19121
## 9           81.87707
## 10          83.99872
## 11          71.18145
## 12          95.63670
## 13          85.82841
## 14          84.25453
## 15         113.85460
```

Note that the `echo = FALSE` parameter was added to the code chunk to prevent printing of the R code that generated the plot.

User defined function

```
Car.Sales.1$Fuel_capacitynew = Car.Sales.1$Fuel_capacity * 3
##creating a new field Fuel_capacitynew which gets value by multiplying field Fuel_capacity by 3
```

Data manipulation techniques and filter rows

```
Car.Sales.1%>% filter(Sales_in_thousands > 39)
```

```
##    Manufacturer          Model Sales_in_thousands X__year_resale_value
## 1         Acura             TL             39.384                19.875
## 2         Buick        Century             91.561                12.475
## 3         Buick          Regal             39.350                13.740
## 4         Buick        LeSabre             83.257                13.360
## 5      Cadillac        DeVille             63.729                22.525
## 6     Chevrolet       Cavalier            145.519                 9.250
## 7     Chevrolet         Malibu            135.126                11.225
## 8     Chevrolet    Monte Carlo             42.593                11.525
## 9     Chevrolet         Impala            107.995                    NA
## 10     Chrysler Town & Country             53.480                19.540
## 11        Dodge           Neon             76.034                 7.750
## 12        Dodge        Stratus             71.186                10.185
```

```
## 13        Dodge        Intrepid            88.028             12.275
## 14        Dodge     Ram Pickup            227.061             15.060
## 15        Dodge          Dakota            111.313             11.260
## 16        Dodge         Durango            101.323                 NA
## 17        Dodge         Caravan            181.749             12.025
## 18         Ford          Escort             70.227              7.425
## 19         Ford         Mustang            113.369             12.760
## 20         Ford          Taurus            245.815             10.055
## 21         Ford           Focus            175.670                 NA
## 22         Ford Crown Victoria             63.403             14.210
## 23         Ford        Explorer            276.747             16.640
## 24         Ford        Windstar            155.787             13.175
## 25         Ford     Expedition             125.338             23.575
## 26         Ford          Ranger            220.650              7.850
## 27         Ford        F-Series            540.561             15.075
## 28        Honda           Civic            199.685              9.850
## 29        Honda          Accord            230.902             13.210
## 30        Honda            CR-V             73.203             17.710
## 31        Honda         Odyssey             76.029             19.490
## 32      Hyundai          Accent             41.184              5.860
## 33      Hyundai         Elantra             66.692              7.825
## 34         Jeep        Wrangler             55.557             13.475
## 35         Jeep        Cherokee             80.556             13.775
## 36         Jeep Grand Cherokee             157.040             18.810
## 37        Lexus           RX300             51.238                 NA
## 38      Lincoln        Town car             48.911             21.725
## 39   Mitsubishi         Eclipse             42.541             10.395
## 40   Mitsubishi          Galant             55.616             10.595
## 41   Mitsubishi  Montero Sport              39.348             13.880
## 42      Mercury           Sable             67.956             11.030
## 43      Mercury  Grand Marquis              81.174             14.875
## 44       Nissan          Sentra             42.643              8.450
## 45       Nissan          Altima             88.094             11.295
## 46       Nissan          Maxima             79.853             15.125
## 47       Nissan     Pathfinder              42.574             17.810
## 48       Nissan          Xterra             54.158                 NA
## 49       Nissan        Frontier             65.005                 NA
## 50   Oldsmobile           Alero             80.255                 NA
## 51      Pontiac         Sunfire             51.645             13.790
## 52      Pontiac        Grand Am            131.097             10.290
## 53      Pontiac     Grand Prix              92.364             14.010
## 54      Pontiac         Montana             39.572                 NA
## 55       Saturn              SL             80.620              9.200
## 56       Saturn              LS             49.989                 NA
## 57       Subaru         Outback             47.107                 NA
## 58       Toyota         Corolla            142.535             10.025
## 59       Toyota           Camry            247.994             13.245
## 60       Toyota          Avalon             63.849             18.140
## 61       Toyota          Tacoma             84.087              9.575
## 62       Toyota          Sienna             65.119                 NA
## 63       Toyota         4Runner             68.411             19.425
## 64   Volkswagen           Jetta             83.721             13.240
## 65   Volkswagen          Passat             51.102             16.725
## 66   Volkswagen          Beetle             49.463                 NA
```

```
##    Vehicle_type Price_in_thousands Engine_size Horsepower Wheelbase Width
## 1     Passenger              28.400         3.2        225     108.1  70.3
## 2     Passenger              21.975         3.1        175     109.0  72.7
## 3     Passenger              25.300         3.8        240     109.0  72.7
## 4     Passenger              27.885         3.8        205     112.2  73.5
## 5     Passenger              39.895         4.6        275     115.3  74.5
## 6     Passenger              13.260         2.2        115     104.1  67.9
## 7     Passenger              16.535         3.1        170     107.0  69.4
## 8     Passenger              19.390         3.4        180     110.5  72.7
## 9     Passenger              18.890         3.4        180     110.5  73.0
## 10          Car               0.000          NA         NA        NA    NA
## 11    Passenger              12.640         2.0        132     105.0  74.4
## 12    Passenger              20.230         2.5        168     108.0  71.0
## 13    Passenger              22.505         2.7        202     113.0  74.7
## 14          Car              19.460         5.2        230     138.7  79.3
## 15          Car              16.980         2.5        120     131.0  71.5
## 16          Car              26.310         5.2        230     115.7  71.7
## 17          Car              19.565         2.4        150     113.3  76.8
## 18    Passenger              12.070         2.0        110      98.4  67.0
## 19    Passenger              21.560         3.8        190     101.3  73.1
## 20    Passenger              17.885         3.0        155     108.5  73.0
## 21    Passenger              12.315         2.0        107     103.0  66.9
## 22    Passenger              22.195         4.6        200     114.7  78.2
## 23          Car              31.930         4.0        210     111.6  70.2
## 24          Car              21.410         3.0        150     120.7  76.6
## 25          Car              36.135         4.6        240     119.0  78.7
## 26          Car              12.050         2.5        119     117.5  69.4
## 27          Car              26.935         4.6        220     138.5  79.1
## 28    Passenger              12.885         1.6        106     103.2  67.1
## 29    Passenger              15.350         2.3        135     106.9  70.3
## 30          Car              20.550         2.0        146     103.2  68.9
## 31          Car              26.000         3.5        210     118.1  75.6
## 32    Passenger               9.699         1.5         92      96.1  65.7
## 33    Passenger              11.799         2.0        140     100.4  66.9
## 34          Car              14.460         2.5        120      93.4  66.7
## 35          Car              21.620         4.0        190     101.4  69.4
## 36          Car              26.895         4.0        195     105.9  72.3
## 37          Car              34.605         3.0        220     103.0  71.5
## 38    Passenger              43.330         4.6        215     117.7  78.2
## 39    Passenger              19.047         2.4        154     100.8  68.9
## 40    Passenger              17.357         2.4        145     103.7  68.5
## 41          Car              22.527         3.0        173     107.3  66.7
## 42    Passenger              19.035         3.0        153     108.5  73.0
## 43    Passenger              22.605         4.6        200     114.7  78.2
## 44    Passenger              13.499         1.8        126      99.8  67.3
## 45    Passenger              20.390         2.4        155     103.1  69.1
## 46    Passenger              26.249         3.0        222     108.3  70.3
## 47          Car              29.299         3.3        170     106.3  71.7
## 48          Car              22.799         3.3        170     104.3  70.4
## 49          Car              17.890         3.3        170     116.1  66.5
## 50    Passenger              18.270         2.4        150     107.0  70.1
## 51    Passenger              21.610         2.4        150     104.1  68.4
## 52    Passenger              19.720         3.4        175     107.0  70.4
## 53    Passenger              21.665         3.8        195     110.5  72.7
```

```
## 54          Car             25.635         3.4        185     120.0  72.7
## 55    Passenger             10.685         1.9        100     102.4  66.4
## 56    Passenger             15.010         2.2        137     106.5  69.0
## 57    Passenger             22.695         2.5        165     103.5  67.5
## 58    Passenger             13.108         1.8        120      97.0  66.7
## 59    Passenger             17.518         2.2        133     105.2  70.1
## 60    Passenger             25.545         3.0        210     107.1  71.7
## 61          Car             11.528         2.4        142     103.3  66.5
## 62          Car             22.368         3.0        194     114.2  73.4
## 63          Car             22.288         2.7        150     105.3  66.5
## 64    Passenger             16.700         2.0        115      98.9  68.3
## 65    Passenger             21.200         1.8        150     106.4  68.5
## 66    Passenger             15.900         2.0        115      98.9  67.9
##    Length Curb_weight Fuel_capacity Fuel_efficiency Latest_Launch
## 1   192.9       3.517          17.2              25      06-03-11
## 2   194.6       3.368          17.5              25      11-02-11
## 3   196.2       3.543          17.5              23      09-03-11
## 4   200.0       3.591          17.5              25     7/23/2011
## 5   207.2       3.978          18.5              22     2/23/2012
## 6   180.9       2.676          14.3              27     8/17/2011
## 7   190.4       3.051          15.0              25     3/19/2012
## 8   197.9       3.340          17.0              27    12/22/2011
## 9   200.0       3.389          17.0              27     6/18/2011
## 10     NA          NA            NA              NA     7/13/2011
## 11  174.4       2.567          12.5              29      12-12-11
## 12  186.0       3.058          16.0              24    10/31/2011
## 13  203.7       3.489          17.0              NA      06-02-12
## 14  224.2       4.470          26.0              17      03-06-12
## 15  215.0       3.557          22.0              19    11/25/2011
## 16  193.5       4.394          25.0              17     6/27/2012
## 17  186.3       3.533          20.0              24      09-01-11
## 18  174.7       2.468          12.7              30     3/31/2012
## 19  183.2       3.203          15.7              24     1/31/2012
## 20  197.6       3.368          16.0              24    12/20/2011
## 21  174.8       2.564          13.2              30     7/22/2012
## 22  212.0       3.908          19.0              21     9/26/2011
## 23  190.7       3.876          21.0              19     4/25/2012
## 24  200.9       3.761          26.0              21     2/25/2012
## 25  204.6       4.808          26.0              16     9/14/2012
## 26  200.7       3.086          20.0              23     1/14/2012
## 27  224.5       4.241          25.1              18     8/16/2012
## 28  175.1       2.339          11.9              32    10/21/2011
## 29  188.8       2.932          17.1              27     5/20/2012
## 30  177.6       3.219          15.3              24     3/21/2012
## 31  201.2       4.288          20.0              23      02-08-12
## 32  166.7       2.240          11.9              31      09-10-12
## 33  174.0       2.626          14.5              27    11/15/2011
## 34  152.0       3.045          19.0              17      03-04-12
## 35  167.5       3.194          20.0              20      10-05-12
## 36  181.5       3.880          20.5              19      12-10-11
## 37  180.1       3.900          17.2              21      01-04-12
## 38  215.3       4.121          19.0              21      06-04-12
## 39  175.4       2.910          15.9              24    11/24/2012
## 40  187.8       2.945          16.3              25     1/29/2012
```

```
## 41  178.3       3.510          19.5              20     5/18/2012
## 42  199.7       3.379          16.0              24     9/22/2012
## 43  212.0       3.958          19.0              21     7/24/2012
## 44  177.5       2.593          13.2              30     8/31/2011
## 45  183.5       3.012          15.9              25      08-02-11
## 46  190.5       3.294          18.5              25      05-06-11
## 47  182.6       3.947          21.0              19     9/25/2011
## 48  178.0       3.821          19.4              18     1/24/2011
## 49  196.1       3.217          19.4              18     8/27/2011
## 50  186.7       2.958          15.0              27    10/20/2009
## 51  181.9       2.906          15.0              27     1/25/2012
## 52  186.3       3.091          15.2              25    11/26/2012
## 53  196.5       3.396          18.0              25    10/15/2012
## 54  201.3       3.942          25.0              23     7/22/2012
## 55  176.9       2.332          12.1              33     8/16/2012
## 56  190.4       2.910          13.1              28      12-04-12
## 57  185.8       3.415          16.9              25      07-07-11
## 58  174.0       2.420          13.2              33      04-11-11
## 59  188.5       2.998          18.5              27      02-10-11
## 60  191.9       3.417          18.5              26     8/31/2011
## 61  178.7       2.580          15.1              23      08-01-11
## 62  193.5       3.759          20.9              22      10-05-12
## 63  183.3       3.440          18.5              23      03-07-11
## 64  172.3       2.853          14.5              26     8/27/2011
## 65  184.1       3.043          16.4              27    10/30/2012
## 66  161.1       2.769          14.5              26    10/20/2011
##    Power_perf_factor Fuel_capacitynew
## 1           91.37078              51.6
## 2           71.18145              52.5
## 3           95.63670              52.5
## 4           84.25453              52.5
## 5          113.85460              55.5
## 6           46.36335              42.9
## 7           67.31446              45.0
## 8           72.03092              51.0
## 9           71.83804              51.0
## 10                NA                NA
## 11          52.08490              37.5
## 12          67.87611              48.0
## 13          80.83147              51.0
## 14          90.21170              78.0
## 15          49.64500              66.0
## 16          92.85413              75.0
## 17          61.22700              60.0
## 18          44.08371              38.1
## 19          76.50918              47.1
## 20          62.50374              48.0
## 21          43.11713              39.6
## 22          80.49954              57.0
## 23          87.63550              63.0
## 24          62.09505              78.0
## 25         100.02480              78.0
## 26          47.38953              60.0
## 27          89.40193              75.3
```

```
## 28          42.87910            35.7
## 29          54.26955            51.3
## 30          60.08797            45.9
## 31          85.21769            60.0
## 32          36.67228            35.7
## 33          54.59005            43.5
## 34          48.67290            57.0
## 35          76.58444            60.0
## 36          80.38778            61.5
## 37          91.94380            51.6
## 38          93.95792            57.0
## 39          62.44196            47.7
## 40          58.60677            48.9
## 41          70.66094            58.5
## 42          62.23997            48.0
## 43          80.65770            57.0
## 44          50.24198            39.6
## 45          63.31373            47.7
## 46          89.42782            55.5
## 47          72.29036            63.0
## 48          69.78294            58.2
## 49          67.88927            58.2
## 50          60.72745            45.0
## 51          62.01587            45.0
## 52          70.38974            45.6
## 53          78.31817            54.0
## 54          76.20844            75.0
## 55          39.98642            36.3
## 56          54.81973            39.3
## 57          67.76591            50.7
## 58          47.96897            39.6
## 59          54.37242            55.5
## 60          84.91190            55.5
## 61          55.29712            45.3
## 62          78.02722            62.7
## 63          62.35558            55.5
## 64          47.63824            43.5
## 65          61.70138            49.2
## 66          47.32963            43.5
```

Dependent & independent variables and use reshaping techniques

```
totalcardim1 = cbind(Car.Sales.1$Length, Car.Sales.1$Width, Car.Sales.1$Wheelbase)

totalcardim1 = as.data.frame(totalcardim1)

names(totalcardim1)[2] = "width1"

names(totalcardim1)[3] = "wheelbase1"

names(totalcardim1)[1] = "length1"
View(totalcardim1)
```

```
## totalcardim1 is dependent variable and length, width, wheelbase are independent variable
```

Remove missing values

```
na.omit(Car.Sales.1)
```

```
##     Manufacturer          Model Sales_in_thousands X__year_resale_value
## 1          Acura        Integra             16.919                16.360
## 2          Acura             TL             39.384                19.875
## 4          Acura             RL              8.588                29.725
## 5           Audi             A4             20.397                22.255
## 6           Audi             A6             18.780                23.555
## 7           Audi             A8              1.380                39.000
## 9            BMW           328i              9.231                28.675
## 10           BMW           528i             17.527                36.125
## 11         Buick        Century             91.561                12.475
## 12         Buick          Regal             39.350                13.740
## 13         Buick    Park Avenue             27.851                20.190
## 14         Buick        LeSabre             83.257                13.360
## 15      Cadillac        DeVille             63.729                22.525
## 17      Cadillac       Eldorado              6.536                25.725
## 18      Cadillac         Catera             11.185                18.225
## 20     Chevrolet       Cavalier            145.519                 9.250
## 21     Chevrolet         Malibu            135.126                11.225
## 22     Chevrolet         Lumina             24.629                10.310
## 23     Chevrolet    Monte Carlo             42.593                11.525
## 24     Chevrolet         Camaro             26.402                13.025
## 25     Chevrolet       Corvette             17.947                36.225
## 26     Chevrolet          Prizm             32.299                 9.125
## 27     Chevrolet          Metro             21.855                 5.160
## 29      Chrysler  Sebring Coupe              7.854                12.360
## 30      Chrysler  Sebring Conv.             32.775                14.180
## 31      Chrysler       Concorde             31.148                13.725
## 32      Chrysler         Cirrus             32.306                12.640
## 33      Chrysler            LHS             13.462                17.325
## 36         Dodge           Neon             76.034                 7.750
## 37         Dodge        Avenger              4.734                12.545
## 38         Dodge        Stratus             71.186                10.185
## 40         Dodge          Viper              0.916                58.470
## 41         Dodge     Ram Pickup            227.061                15.060
## 42         Dodge      Ram Wagon             16.767                15.510
## 43         Dodge        Ram Van             31.038                13.425
## 44         Dodge         Dakota            111.313                11.260
## 46         Dodge        Caravan            181.749                12.025
## 47          Ford         Escort             70.227                 7.425
## 48          Ford        Mustang            113.369                12.760
## 49          Ford        Contour             35.068                 8.835
## 50          Ford         Taurus            245.815                10.055
## 52          Ford Crown Victoria             63.403                14.210
## 53          Ford       Explorer            276.747                16.640
## 54          Ford       Windstar            155.787                13.175
```

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## 55          Ford     Expedition          125.338              23.575
## 56          Ford         Ranger          220.650               7.850
## 57          Ford       F-Series          540.561              15.075
## 58         Honda          Civic          199.685               9.850
## 59         Honda         Accord          230.902              13.210
## 60         Honda            CR-V           73.203              17.710
## 61         Honda       Passport           12.855              17.525
## 62         Honda        Odyssey           76.029              19.490
## 63       Hyundai         Accent           41.184               5.860
## 64       Hyundai        Elantra           66.692               7.825
## 65       Hyundai         Sonata           29.450               8.910
## 66      Infiniti            I30           23.713              19.690
## 68          Jeep       Wrangler           55.557              13.475
## 69          Jeep       Cherokee           80.556              13.775
## 70          Jeep Grand Cherokee          157.040              18.810
## 71         Lexus          ES300           24.072              26.975
## 72         Lexus          GS300           12.698              32.075
## 74         Lexus          LS400            6.375              40.375
## 77       Lincoln    Continental           13.798              20.525
## 78       Lincoln       Town car           48.911              21.725
## 80    Mitsubishi         Mirage           26.232               8.325
## 81    Mitsubishi        Eclipse           42.541              10.395
## 82    Mitsubishi         Galant           55.616              10.595
## 83    Mitsubishi       Diamante            5.711              16.575
## 84    Mitsubishi         3000GT            0.110              20.940
## 85    Mitsubishi        Montero           11.337              19.125
## 86    Mitsubishi  Montero Sport           39.348              13.880
## 87       Mercury       Mystique           14.351               8.800
## 88       Mercury         Cougar           26.529              13.890
## 89       Mercury          Sable           67.956              11.030
## 90       Mercury  Grand Marquis           81.174              14.875
## 91       Mercury    Mountaineer           27.609              20.430
## 92       Mercury       Villager           20.380              14.795
## 93    Mercedes-B        C-Class           18.392              26.050
## 94    Mercedes-B        E-Class           27.602              41.450
## 95    Mercedes-B        S-Class           16.774              50.375
## 96    Mercedes-B       SL-Class            3.311              58.600
## 102       Nissan         Sentra           42.643               8.450
## 103       Nissan         Altima           88.094              11.295
## 104       Nissan         Maxima           79.853              15.125
## 105       Nissan          Quest           27.308              15.380
## 106       Nissan     Pathfinder           42.574              17.810
## 109   Oldsmobile        Cutlass            1.112              11.240
## 112   Oldsmobile         Aurora           14.690              19.890
## 113   Oldsmobile        Bravada           20.017              19.925
## 114   Oldsmobile     Silhouette           24.361              15.240
## 115     Plymouth           Neon           32.734               7.750
## 116     Plymouth         Breeze            5.240               9.800
## 117     Plymouth        Voyager           24.155              12.025
## 119      Pontiac        Sunfire           51.645              13.790
## 120      Pontiac       Grand Am          131.097              10.290
## 121      Pontiac       Firebird           19.911              17.805
## 122      Pontiac     Grand Prix           92.364              14.010
## 123      Pontiac     Bonneville           35.945              13.225
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## 125      Porsche         Boxter             8.982              41.250
## 126      Porsche  Carrera Coupe             1.280              60.625
## 127      Porsche Carrera Cabrio             1.866              67.550
## 130       Saturn             SL            80.620               9.200
## 131       Saturn             SC            24.546              10.590
## 132       Saturn             SW             5.223              10.790
## 137       Toyota        Corolla           142.535              10.025
## 138       Toyota          Camry           247.994              13.245
## 139       Toyota         Avalon            63.849              18.140
## 140       Toyota         Celica            33.269              15.445
## 141       Toyota         Tacoma            84.087               9.575
## 143       Toyota           RAV4            25.106              13.325
## 144       Toyota        4Runner            68.411              19.425
## 145       Toyota   Land Cruiser             9.835              34.080
## 146   Volkswagen           Golf             9.761              11.425
## 147   Volkswagen          Jetta            83.721              13.240
## 148   Volkswagen         Passat            51.102              16.725
## 149   Volkswagen         Cabrio             9.569              16.575
## 150   Volkswagen            GTI             5.596              13.760
##     Vehicle_type Price_in_thousands Engine_size Horsepower Wheelbase Width
## 1      Passenger              21.500         1.8        140     101.2  67.3
## 2      Passenger              28.400         3.2        225     108.1  70.3
## 4      Passenger              42.000         3.5        210     114.6  71.4
## 5      Passenger              23.990         1.8        150     102.6  68.2
## 6      Passenger              33.950         2.8        200     108.7  76.1
## 7      Passenger              62.000         4.2        310     113.0  74.0
## 9      Passenger              33.400         2.8        193     107.3  68.5
## 10     Passenger              38.900         2.8        193     111.4  70.9
## 11     Passenger              21.975         3.1        175     109.0  72.7
## 12     Passenger              25.300         3.8        240     109.0  72.7
## 13     Passenger              31.965         3.8        205     113.8  74.7
## 14     Passenger              27.885         3.8        205     112.2  73.5
## 15     Passenger              39.895         4.6        275     115.3  74.5
## 17     Passenger              39.665         4.6        275     108.0  75.5
## 18     Passenger              31.010         3.0        200     107.4  70.3
## 20     Passenger              13.260         2.2        115     104.1  67.9
## 21     Passenger              16.535         3.1        170     107.0  69.4
## 22     Passenger              18.890         3.1        175     107.5  72.5
## 23     Passenger              19.390         3.4        180     110.5  72.7
## 24     Passenger              24.340         3.8        200     101.1  74.1
## 25     Passenger              45.705         5.7        345     104.5  73.6
## 26     Passenger              13.960         1.8        120      97.1  66.7
## 27     Passenger               9.235         1.0         55      93.1  62.6
## 29     Passenger              19.840         2.5        163     103.7  69.7
## 30     Passenger              24.495         2.5        168     106.0  69.2
## 31     Passenger              22.245         2.7        200     113.0  74.4
## 32     Passenger              16.480         2.0        132     108.0  71.0
## 33     Passenger              28.340         3.5        253     113.0  74.4
## 36     Passenger              12.640         2.0        132     105.0  74.4
## 37     Passenger              19.045         2.5        163     103.7  69.1
## 38     Passenger              20.230         2.5        168     108.0  71.0
## 40     Passenger              69.725         8.0        450      96.2  75.7
## 41           Car              19.460         5.2        230     138.7  79.3
## 42           Car              21.315         3.9        175     109.6  78.8
```

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## 43          Car            18.575        3.9        175     127.2  78.8
## 44          Car            16.980        2.5        120     131.0  71.5
## 46          Car            19.565        2.4        150     113.3  76.8
## 47    Passenger            12.070        2.0        110      98.4  67.0
## 48    Passenger            21.560        3.8        190     101.3  73.1
## 49    Passenger            17.035        2.5        170     106.5  69.1
## 50    Passenger            17.885        3.0        155     108.5  73.0
## 52    Passenger            22.195        4.6        200     114.7  78.2
## 53          Car            31.930        4.0        210     111.6  70.2
## 54          Car            21.410        3.0        150     120.7  76.6
## 55          Car            36.135        4.6        240     119.0  78.7
## 56          Car            12.050        2.5        119     117.5  69.4
## 57          Car            26.935        4.6        220     138.5  79.1
## 58    Passenger            12.885        1.6        106     103.2  67.1
## 59    Passenger            15.350        2.3        135     106.9  70.3
## 60          Car            20.550        2.0        146     103.2  68.9
## 61          Car            26.600        3.2        205     106.4  70.4
## 62          Car            26.000        3.5        210     118.1  75.6
## 63    Passenger             9.699        1.5         92      96.1  65.7
## 64    Passenger            11.799        2.0        140     100.4  66.9
## 65    Passenger            14.999        2.4        148     106.3  71.6
## 66    Passenger            29.465        3.0        227     108.3  70.2
## 68          Car            14.460        2.5        120      93.4  66.7
## 69          Car            21.620        4.0        190     101.4  69.4
## 70          Car            26.895        4.0        195     105.9  72.3
## 71    Passenger            31.505        3.0        210     105.1  70.5
## 72    Passenger            37.805        3.0        225     110.2  70.9
## 74    Passenger            54.005        4.0        290     112.2  72.0
## 77    Passenger            39.080        4.6        275     109.0  73.6
## 78    Passenger            43.330        4.6        215     117.7  78.2
## 80    Passenger            13.987        1.8        113      98.4  66.5
## 81    Passenger            19.047        2.4        154     100.8  68.9
## 82    Passenger            17.357        2.4        145     103.7  68.5
## 83    Passenger            24.997        3.5        210     107.1  70.3
## 84    Passenger            25.450        3.0        161      97.2  72.4
## 85          Car            31.807        3.5        200     107.3  69.9
## 86          Car            22.527        3.0        173     107.3  66.7
## 87    Passenger            16.240        2.0        125     106.5  69.1
## 88    Passenger            16.540        2.0        125     106.4  69.6
## 89    Passenger            19.035        3.0        153     108.5  73.0
## 90    Passenger            22.605        4.6        200     114.7  78.2
## 91          Car            27.560        4.0        210     111.6  70.2
## 92          Car            22.510        3.3        170     112.2  74.9
## 93    Passenger            31.750        2.3        185     105.9  67.7
## 94    Passenger            49.900        3.2        221     111.5  70.8
## 95    Passenger            69.700        4.3        275     121.5  73.1
## 96    Passenger            82.600        5.0        302      99.0  71.3
## 102   Passenger            13.499        1.8        126      99.8  67.3
## 103   Passenger            20.390        2.4        155     103.1  69.1
## 104   Passenger            26.249        3.0        222     108.3  70.3
## 105         Car            26.399        3.3        170     112.2  74.9
## 106         Car            29.299        3.3        170     106.3  71.7
## 109   Passenger            18.145        3.1        150     107.0  69.4
## 112   Passenger            36.229        4.0        250     113.8  74.4
```

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## 113          Car            31.598         4.3        190     107.0  67.8
## 114          Car            25.345         3.4        185     120.0  72.2
## 115    Passenger            12.640         2.0        132     105.0  74.4
## 116    Passenger            16.080         2.0        132     108.0  71.0
## 117          Car            18.850         2.4        150     113.3  76.8
## 119    Passenger            21.610         2.4        150     104.1  68.4
## 120    Passenger            19.720         3.4        175     107.0  70.4
## 121    Passenger            25.310         3.8        200     101.1  74.5
## 122    Passenger            21.665         3.8        195     110.5  72.7
## 123    Passenger            23.755         3.8        205     112.2  72.6
## 125    Passenger            41.430         2.7        217      95.2  70.1
## 126    Passenger            71.020         3.4        300      92.6  69.5
## 127    Passenger            74.970         3.4        300      92.6  69.5
## 130    Passenger            10.685         1.9        100     102.4  66.4
## 131    Passenger            12.535         1.9        100     102.4  66.4
## 132    Passenger            14.290         1.9        124     102.4  66.4
## 137    Passenger            13.108         1.8        120      97.0  66.7
## 138    Passenger            17.518         2.2        133     105.2  70.1
## 139    Passenger            25.545         3.0        210     107.1  71.7
## 140    Passenger            16.875         1.8        140     102.4  68.3
## 141          Car            11.528         2.4        142     103.3  66.5
## 143          Car            16.888         2.0        127      94.9  66.7
## 144          Car            22.288         2.7        150     105.3  66.5
## 145          Car            51.728         4.7        230     112.2  76.4
## 146    Passenger            14.900         2.0        115      98.9  68.3
## 147    Passenger            16.700         2.0        115      98.9  68.3
## 148    Passenger            21.200         1.8        150     106.4  68.5
## 149    Passenger            19.990         2.0        115      97.4  66.7
## 150    Passenger            17.500         2.0        115      98.9  68.3
##     Length Curb_weight Fuel_capacity Fuel_efficiency Latest_Launch
## 1    172.4       2.639          13.2              28      02-02-12
## 2    192.9       3.517          17.2              25      06-03-11
## 4    196.6       3.850          18.0              22      03-10-11
## 5    178.0       2.998          16.4              27      10-08-11
## 6    192.0       3.561          18.5              22      08-09-11
## 7    198.2       3.902          23.7              21     2/27/2012
## 9    176.0       3.197          16.6              24     1/29/2012
## 10   188.0       3.472          18.5              25      04-04-11
## 11   194.6       3.368          17.5              25      11-02-11
## 12   196.2       3.543          17.5              23      09-03-11
## 13   206.8       3.778          18.5              24     3/23/2012
## 14   200.0       3.591          17.5              25     7/23/2011
## 15   207.2       3.978          18.5              22     2/23/2012
## 17   200.6       3.843          19.0              22    11/27/2011
## 18   194.8       3.770          18.0              22     9/28/2011
## 20   180.9       2.676          14.3              27     8/17/2011
## 21   190.4       3.051          15.0              25     3/19/2012
## 22   200.9       3.330          16.6              25     5/24/2011
## 23   197.9       3.340          17.0              27    12/22/2011
## 24   193.2       3.500          16.8              25    10/23/2011
## 25   179.7       3.210          19.1              22      05-12-12
## 26   174.3       2.398          13.2              33      09-11-11
## 27   149.4       1.895          10.3              45     4/13/2012
## 29   190.9       2.967          15.9              24     1/16/2012
```

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## 30   193.0       3.332          16.0             24    11/17/2011
## 31   209.1       3.452          17.0             26      06-06-12
## 32   186.0       2.911          16.0             27      10-06-11
## 33   207.7       3.564          17.0             23      05-08-12
## 36   174.4       2.567          12.5             29      12-12-11
## 37   190.2       2.879          15.9             24      07-01-12
## 38   186.0       3.058          16.0             24    10/31/2011
## 40   176.7       3.375          19.0             16      08-07-11
## 41   224.2       4.470          26.0             17      03-06-12
## 42   192.6       4.245          32.0             15      01-06-12
## 43   208.5       4.298          32.0             16     7/26/2012
## 44   215.0       3.557          22.0             19    11/25/2011
## 46   186.3       3.533          20.0             24      09-01-11
## 47   174.7       2.468          12.7             30     3/31/2012
## 48   183.2       3.203          15.7             24     1/31/2012
## 49   184.6       2.769          15.0             25     8/20/2012
## 50   197.6       3.368          16.0             24    12/20/2011
## 52   212.0       3.908          19.0             21     9/26/2011
## 53   190.7       3.876          21.0             19     4/25/2012
## 54   200.9       3.761          26.0             21     2/25/2012
## 55   204.6       4.808          26.0             16     9/14/2012
## 56   200.7       3.086          20.0             23     1/14/2012
## 57   224.5       4.241          25.1             18     8/16/2012
## 58   175.1       2.339          11.9             32    10/21/2011
## 59   188.8       2.932          17.1             27     5/20/2012
## 60   177.6       3.219          15.3             24     3/21/2012
## 61   178.2       3.857          21.1             19      10-09-12
## 62   201.2       4.288          20.0             23      02-08-12
## 63   166.7       2.240          11.9             31      09-10-12
## 64   174.0       2.626          14.5             27    11/15/2011
## 65   185.4       3.072          17.2             25     6/14/2012
## 66   193.7       3.342          18.5             25     4/15/2012
## 68   152.0       3.045          19.0             17      03-04-12
## 69   167.5       3.194          20.0             20      10-05-12
## 70   181.5       3.880          20.5             19      12-10-11
## 71   190.2       3.373          18.5             23      07-09-12
## 72   189.2       3.638          19.8             23      05-10-12
## 74   196.7       3.890          22.5             22     3/29/2012
## 77   208.5       3.868          20.0             22      08-03-12
## 78   215.3       4.121          19.0             21      06-04-12
## 80   173.6       2.250          13.2             30     4/23/2012
## 81   175.4       2.910          15.9             24    11/24/2012
## 82   187.8       2.945          16.3             25     1/29/2012
## 83   194.1       3.443          19.0             22     8/28/2012
## 84   180.3       3.131          19.8             21     6/29/2012
## 85   186.6       4.520          24.3             18     1/17/2012
## 86   178.3       3.510          19.5             20     5/18/2012
## 87   184.8       2.769          15.0             28    12/19/2012
## 88   185.0       2.892          16.0             30     2/23/2012
## 89   199.7       3.379          16.0             24     9/22/2012
## 90   212.0       3.958          19.0             21     7/24/2012
## 91   190.1       3.876          21.0             18     2/13/2008
## 92   194.7       3.944          20.0             21    10/20/2009
## 93   177.4       3.250          16.4             26     4/24/2011
```

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## 94   189.4       3.823          21.1              25      07-12-11
## 95   203.1       4.133          23.2              21     6/13/2011
## 96   177.1       4.125          21.1              20     3/17/2011
## 102  177.5       2.593          13.2              30     8/31/2011
## 103  183.5       3.012          15.9              25      08-02-11
## 104  190.5       3.294          18.5              25      05-06-11
## 105  194.8       3.991          20.0              21      03-07-11
## 106  182.6       3.947          21.0              19     9/25/2011
## 109  192.0       3.102          15.2              25     5/31/2011
## 112  205.4       3.967          18.5              22     2/18/2011
## 113  181.2       4.068          17.5              19     9/21/2011
## 114  201.4       3.948          25.0              22     6/25/2011
## 115  174.4       2.559          12.5              29     4/26/2011
## 116  186.3       2.942          16.0              27    11/14/2011
## 117  186.3       3.528          20.0              24     4/24/2011
## 119  181.9       2.906          15.0              27     1/25/2012
## 120  186.3       3.091          15.2              25    11/26/2012
## 121  193.4       3.492          16.8              25     6/16/2012
## 122  196.5       3.396          18.0              25    10/15/2012
## 123  202.5       3.590          17.5              24     5/18/2011
## 125  171.0       2.778          17.0              22     2/19/2012
## 126  174.5       3.032          17.0              21    12/21/2012
## 127  174.5       3.075          17.0              23      07-11-11
## 130  176.9       2.332          12.1              33     8/16/2012
## 131  180.0       2.367          12.1              33     3/16/2011
## 132  176.9       2.452          12.1              31     1/15/2011
## 137  174.0       2.420          13.2              33      04-11-11
## 138  188.5       2.998          18.5              27      02-10-11
## 139  191.9       3.417          18.5              26     8/31/2011
## 140  170.5       2.425          14.5              31    12/29/2012
## 141  178.7       2.580          15.1              23      08-01-11
## 143  163.8       2.668          15.3              27      05-06-11
## 144  183.3       3.440          18.5              23      03-07-11
## 145  192.5       5.115          25.4              15     9/25/2011
## 146  163.3       2.767          14.5              26     1/24/2011
## 147  172.3       2.853          14.5              26     8/27/2011
## 148  184.1       3.043          16.4              27    10/30/2012
## 149  160.4       3.079          13.7              26     5/31/2011
## 150  163.3       2.762          14.6              26      04-01-11
##     Power_perf_factor Fuel_capacitynew
## 1           58.28015              39.6
## 2           91.37078              51.6
## 4           91.38978              54.0
## 5           62.77764              49.2
## 6           84.56511              55.5
## 7          134.65686              71.1
## 9           81.87707              49.8
## 10          83.99872              55.5
## 11          71.18145              52.5
## 12          95.63670              52.5
## 13          85.82841              55.5
## 14          84.25453              52.5
## 15         113.85460              55.5
## 17         113.76587              57.0
```

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## 18          83.48309          54.0
## 20          46.36335          42.9
## 21          67.31446          45.0
## 22          69.99140          49.8
## 23          72.03092          51.0
## 24          81.11854          50.4
## 25         141.14115          57.3
## 26          48.29764          39.6
## 27          23.27627          30.9
## 29          65.95718          47.7
## 30          69.52136          48.0
## 31          80.02378          51.0
## 32          53.56620          48.0
## 33         101.32928          51.0
## 36          52.08490          37.5
## 37          65.65051          47.7
## 38          67.87611          48.0
## 40         188.14432          57.0
## 41          90.21170          78.0
## 42          71.13529          96.0
## 43          70.07832          96.0
## 44          49.64500          66.0
## 46          61.22700          60.0
## 47          44.08371          38.1
## 48          76.50918          47.1
## 49          67.35101          45.0
## 50          62.50374          48.0
## 52          80.49954          57.0
## 53          87.63550          63.0
## 54          62.09505          78.0
## 55         100.02480          78.0
## 56          47.38953          60.0
## 57          89.40193          75.3
## 58          42.87910          35.7
## 59          54.26955          51.3
## 60          60.08797          45.9
## 61          83.60250          63.3
## 62          85.21769          60.0
## 63          36.67228          35.7
## 64          54.59005          43.5
## 65          58.75825          51.6
## 66          92.43689          55.5
## 68          48.67290          57.0
## 69          76.58444          60.0
## 70          80.38778          61.5
## 71          87.21100          55.5
## 72          94.94670          59.4
## 74         124.44672          67.5
## 77         113.54021          60.0
## 78          93.95792          57.0
## 80          45.83218          39.6
## 81          62.44196          47.7
## 82          58.60677          48.9
## 83          84.83078          57.0
```

```
## 84          67.54415          59.4
## 85          83.92082          72.9
## 86          70.66094          58.5
## 87          50.99775          45.0
## 88          51.11347          48.0
## 89          62.23997          48.0
## 90          80.65770          57.0
## 91          85.94974          63.0
## 92          69.67146          60.0
## 93          78.28073          49.2
## 94          98.24974          63.3
## 95         125.27388          69.6
## 96         139.98229          63.3
## 102         50.24198          39.6
## 103         63.31373          47.7
## 104         89.42782          55.5
## 105         71.17166          60.0
## 106         72.29036          63.0
## 109         60.86161          45.6
## 112        103.44169          55.5
## 113         80.51167          52.5
## 114         76.09657          75.0
## 115         52.08490          37.5
## 116         53.41190          48.0
## 117         60.95119          60.0
## 119         62.01587          45.0
## 120         70.38974          45.6
## 121         81.49273          50.4
## 122         78.31817          54.0
## 123         82.66136          52.5
## 125         93.43733          51.0
## 126        134.39098          51.0
## 127        135.91471          51.0
## 130         39.98642          36.3
## 131         40.70007          36.3
## 132         49.86577          36.3
## 137         47.96897          39.6
## 138         54.37242          55.5
## 139         84.91190          55.5
## 140         56.49603          43.5
## 141         55.29712          45.3
## 143         51.95511          45.9
## 144         62.35558          55.5
## 145        102.52898          76.2
## 146         46.94388          43.5
## 147         47.63824          43.5
## 148         61.70138          49.2
## 149         48.90737          41.1
## 150         47.94684          43.8
```

Remove duplicated data

```
duplicated(Car.Sales.1)
```

```
##   [1] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
##  [13] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
##  [25] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
##  [37] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
##  [49] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
##  [61] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
##  [73] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
##  [85] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
##  [97] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [109] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [121] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [133] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [145] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [157] FALSE
```

Reorder multiple rows

```
Car.Sales.1%>%arrange(desc(Curb_weight))
```

```
##     Manufacturer          Model Sales_in_thousands X__year_resale_value
## 1       Cadillac       Escalade             14.785                   NA
## 2          Lexus          LX470              9.126                   NA
## 3        Lincoln      Navigator             22.925                   NA
## 4         Toyota   Land Cruiser              9.835                34.080
## 5           Ford     Expedition            125.338                23.575
## 6     Mitsubishi        Montero             11.337                19.125
## 7          Dodge     Ram Pickup            227.061                15.060
## 8          Dodge        Durango            101.323                   NA
## 9     Mercedes-B        M-Class             28.976                   NA
## 10         Dodge        Ram Van             31.038                13.425
## 11         Honda        Odyssey             76.029                19.490
## 12         Dodge      Ram Wagon             16.767                15.510
## 13          Ford       F-Series            540.561                15.075
## 14    Mercedes-B        S-Class             16.774                50.375
## 15    Mercedes-B       SL-Class              3.311                58.600
## 16       Lincoln       Town car             48.911                21.725
## 17    Mercedes-B          CL500              0.954                   NA
## 18    Oldsmobile        Bravada             20.017                19.925
## 19        Nissan          Quest             27.308                15.380
## 20      Cadillac        DeVille             63.729                22.525
## 21    Oldsmobile         Aurora             14.690                19.890
## 22       Mercury  Grand Marquis             81.174                14.875
## 23    Oldsmobile     Silhouette             24.361                15.240
## 24        Nissan     Pathfinder             42.574                17.810
## 25       Mercury       Villager             20.380                14.795
## 26       Pontiac        Montana             39.572                   NA
```

```
## 27          Ford Crown Victoria            63.403             14.210
## 28          Audi              A8             1.380             39.000
## 29         Lexus           RX300            51.238                 NA
## 30         Lexus           LS400             6.375             40.375
## 31          Jeep Grand Cherokee           157.040             18.810
## 32          Ford        Explorer           276.747             16.640
## 33       Mercury     Mountaineer            27.609             20.430
## 34       Lincoln     Continental            13.798             20.525
## 35         Honda        Passport            12.855             17.525
## 36         Acura              RL             8.588             29.725
## 37      Cadillac        Eldorado             6.536             25.725
## 38    Mercedes-B         E-Class            27.602             41.450
## 39        Nissan          Xterra            54.158                 NA
## 40         Buick     Park Avenue            27.851             20.190
## 41      Cadillac          Catera            11.185             18.225
## 42          Ford        Windstar           155.787             13.175
## 43        Toyota          Sienna            65.119                 NA
## 44         Lexus           GS400             3.334                 NA
## 45        Jaguar          S-Type            15.467                 NA
## 46         Lexus           GS300            12.698             32.075
## 47         Volvo             C70             3.493                 NA
## 48         Volvo             S80            18.969                 NA
## 49         Buick        LeSabre            83.257             13.360
## 50       Pontiac     Bonneville            35.945             13.225
## 51      Chrysler            300M            30.696                 NA
## 52      Chrysler             LHS            13.462             17.325
## 53          Audi              A6            18.780             23.555
## 54         Dodge          Dakota           111.313             11.260
## 55         Buick           Regal            39.350             13.740
## 56         Dodge         Caravan           181.749             12.025
## 57      Plymouth         Voyager            24.155             12.025
## 58         Acura              TL            39.384             19.875
## 59    Mitsubishi  Montero Sport            39.348             13.880
## 60     Chevrolet          Camaro            26.402             13.025
## 61       Pontiac        Firebird            19.911             17.805
## 62         Dodge        Intrepid            88.028             12.275
## 63           BMW            528i            17.527             36.125
## 64         Acura              CL            14.114             18.225
## 65    Oldsmobile        Intrigue            38.554                 NA
## 66      Chrysler        Concorde            31.148             13.725
## 67    Mitsubishi        Diamante             5.711             16.575
## 68        Toyota         4Runner            68.411             19.425
## 69        Toyota          Avalon            63.849             18.140
## 70        Subaru         Outback            47.107                 NA
## 71       Pontiac      Grand Prix            92.364             14.010
## 72     Chevrolet          Impala           107.995                 NA
## 73       Mercury           Sable            67.956             11.030
## 74         Dodge           Viper             0.916             58.470
## 75         Lexus           ES300            24.072             26.975
## 76         Buick         Century            91.561             12.475
## 77          Ford          Taurus           245.815             10.055
## 78      Infiniti             I30            23.713             19.690
## 79     Chevrolet    Monte Carlo            42.593             11.525
## 80      Chrysler  Sebring Conv.            32.775             14.180
```

```
## 81     Chevrolet         Lumina            24.629             10.310
## 82        Nissan         Maxima            79.853             15.125
## 83          Saab         05-Sep             9.191                 NA
## 84         Volvo            V70            17.531                 NA
## 85    Mercedes-B        C-Class            18.392             26.050
## 86         Honda           CR-V            73.203             17.710
## 87        Nissan       Frontier            65.005                 NA
## 88    Mercedes-B      CLK Coupe            11.592                 NA
## 89     Chevrolet       Corvette            17.947             36.225
## 90         Volvo            S70            15.245                 NA
## 91          Ford        Mustang           113.369             12.760
## 92           BMW           328i             9.231             28.675
## 93          Jeep       Cherokee            80.556             13.775
## 94           BMW           323i            19.747                 NA
## 95    Mitsubishi         3000GT             0.110             20.940
## 96        Subaru       Forester            33.028                 NA
## 97    Oldsmobile        Cutlass             1.112             11.240
## 98       Pontiac       Grand Am           131.097             10.290
## 99          Ford         Ranger           220.650              7.850
## 100   Volkswagen         Cabrio             9.569             16.575
## 101      Porsche Carrera Cabrio             1.866             67.550
## 102       Saturn             LW             8.472                 NA
## 103      Hyundai         Sonata            29.450              8.910
## 104       Dodge        Stratus            71.186             10.185
## 105   Mercedes-B            SLK             7.998                 NA
## 106    Chevrolet         Malibu           135.126             11.225
## 107         Jeep       Wrangler            55.557             13.475
## 108   Volkswagen          Passat            51.102             16.725
## 109        Volvo            V40             3.545                 NA
## 110      Porsche  Carrera Coupe             1.280             60.625
## 111       Nissan         Altima            88.094             11.295
## 112         Audi             A4            20.397             22.255
## 113       Toyota          Camry           247.994             13.245
## 114        Volvo            S40            16.957                 NA
## 115         Saab         03-Sep            12.115                 NA
## 116   Mercedes-B         SLK230             1.526                 NA
## 117     Chrysler  Sebring Coupe             7.854             12.360
## 118   Oldsmobile          Alero            80.255                 NA
## 119   Mitsubishi         Galant            55.616             10.595
## 120     Plymouth         Breeze             5.240              9.800
## 121        Honda         Accord           230.902             13.210
## 122     Chrysler         Cirrus            32.306             12.640
## 123   Mitsubishi        Eclipse            42.541             10.395
## 124       Saturn             LS            49.989                 NA
## 125      Pontiac        Sunfire            51.645             13.790
## 126      Mercury         Cougar            26.529             13.890
## 127       Dodge        Avenger             4.734             12.545
## 128   Volkswagen          Jetta            83.721             13.240
## 129     Plymouth        Prowler             1.872                 NA
## 130      Porsche         Boxter             8.982             41.250
## 131         Ford        Contour            35.068              8.835
## 132      Mercury       Mystique            14.351              8.800
## 133   Volkswagen         Beetle            49.463                 NA
## 134   Volkswagen           Golf             9.761             11.425
```

```
## 135   Volkswagen            GTI             5.596              13.760
## 136    Chevrolet       Cavalier           145.519               9.250
## 137       Toyota           RAV4            25.106              13.325
## 138        Acura        Integra            16.919              16.360
## 139      Hyundai        Elantra            66.692               7.825
## 140       Nissan         Sentra            42.643               8.450
## 141       Toyota         Tacoma            84.087               9.575
## 142        Dodge           Neon            76.034               7.750
## 143         Ford          Focus           175.670                  NA
## 144     Plymouth           Neon            32.734               7.750
## 145         Ford         Escort            70.227               7.425
## 146       Saturn             SW             5.223              10.790
## 147       Toyota         Celica            33.269              15.445
## 148       Toyota        Corolla           142.535              10.025
## 149    Chevrolet          Prizm            32.299               9.125
## 150       Saturn             SC            24.546              10.590
## 151        Honda          Civic           199.685               9.850
## 152       Saturn             SL            80.620               9.200
## 153   Mitsubishi         Mirage            26.232               8.325
## 154      Hyundai         Accent            41.184               5.860
## 155    Chevrolet          Metro            21.855               5.160
## 156     Cadillac        Seville            15.943              27.100
## 157     Chrysler Town & Country            53.480              19.540
##     Vehicle_type Price_in_thousands Engine_size Horsepower Wheelbase Width
## 1            Car              46.225         5.7        255     117.5  77.0
## 2            Car              60.105         4.7        230     112.2  76.4
## 3            Car              42.660         5.4        300     119.0  79.9
## 4            Car              51.728         4.7        230     112.2  76.4
## 5            Car              36.135         4.6        240     119.0  78.7
## 6            Car              31.807         3.5        200     107.3  69.9
## 7            Car              19.460         5.2        230     138.7  79.3
## 8            Car              26.310         5.2        230     115.7  71.7
## 9            Car              35.300         3.2        215     111.0  72.2
## 10           Car              18.575         3.9        175     127.2  78.8
## 11           Car              26.000         3.5        210     118.1  75.6
## 12           Car              21.315         3.9        175     109.6  78.8
## 13           Car              26.935         4.6        220     138.5  79.1
## 14     Passenger              69.700         4.3        275     121.5  73.1
## 15     Passenger              82.600         5.0        302      99.0  71.3
## 16     Passenger              43.330         4.6        215     117.7  78.2
## 17     Passenger              85.500         5.0        302     113.6  73.1
## 18           Car              31.598         4.3        190     107.0  67.8
## 19           Car              26.399         3.3        170     112.2  74.9
## 20     Passenger              39.895         4.6        275     115.3  74.5
## 21     Passenger              36.229         4.0        250     113.8  74.4
## 22     Passenger              22.605         4.6        200     114.7  78.2
## 23           Car              25.345         3.4        185     120.0  72.2
## 24           Car              29.299         3.3        170     106.3  71.7
## 25           Car              22.510         3.3        170     112.2  74.9
## 26           Car              25.635         3.4        185     120.0  72.7
## 27     Passenger              22.195         4.6        200     114.7  78.2
## 28     Passenger              62.000         4.2        310     113.0  74.0
## 29           Car              34.605         3.0        220     103.0  71.5
## 30     Passenger              54.005         4.0        290     112.2  72.0
```

```
## 31          Car            26.895        4.0        195     105.9  72.3
## 32          Car            31.930        4.0        210     111.6  70.2
## 33          Car            27.560        4.0        210     111.6  70.2
## 34    Passenger            39.080        4.6        275     109.0  73.6
## 35          Car            26.600        3.2        205     106.4  70.4
## 36    Passenger            42.000        3.5        210     114.6  71.4
## 37    Passenger            39.665        4.6        275     108.0  75.5
## 38    Passenger            49.900        3.2        221     111.5  70.8
## 39          Car            22.799        3.3        170     104.3  70.4
## 40    Passenger            31.965        3.8        205     113.8  74.7
## 41    Passenger            31.010        3.0        200     107.4  70.3
## 42          Car            21.410        3.0        150     120.7  76.6
## 43          Car            22.368        3.0        194     114.2  73.4
## 44    Passenger            46.305        4.0        300     110.2  70.9
## 45    Passenger            42.800        3.0        240     114.5  71.6
## 46    Passenger            37.805        3.0        225     110.2  70.9
## 47    Passenger            45.500        2.3        236     104.9  71.5
## 48    Passenger            36.000        2.9        201     109.9  72.1
## 49    Passenger            27.885        3.8        205     112.2  73.5
## 50    Passenger            23.755        3.8        205     112.2  72.6
## 51    Passenger            29.185        3.5        253     113.0  74.4
## 52    Passenger            28.340        3.5        253     113.0  74.4
## 53    Passenger            33.950        2.8        200     108.7  76.1
## 54          Car            16.980        2.5        120     131.0  71.5
## 55    Passenger            25.300        3.8        240     109.0  72.7
## 56          Car            19.565        2.4        150     113.3  76.8
## 57          Car            18.850        2.4        150     113.3  76.8
## 58    Passenger            28.400        3.2        225     108.1  70.3
## 59          Car            22.527        3.0        173     107.3  66.7
## 60    Passenger            24.340        3.8        200     101.1  74.1
## 61    Passenger            25.310        3.8        200     101.1  74.5
## 62    Passenger            22.505        2.7        202     113.0  74.7
## 63    Passenger            38.900        2.8        193     111.4  70.9
## 64    Passenger             0.000        3.2        225     106.9  70.6
## 65    Passenger            24.150        3.5        215     109.0  73.6
## 66    Passenger            22.245        2.7        200     113.0  74.4
## 67    Passenger            24.997        3.5        210     107.1  70.3
## 68          Car            22.288        2.7        150     105.3  66.5
## 69    Passenger            25.545        3.0        210     107.1  71.7
## 70    Passenger            22.695        2.5        165     103.5  67.5
## 71    Passenger            21.665        3.8        195     110.5  72.7
## 72    Passenger            18.890        3.4        180     110.5  73.0
## 73    Passenger            19.035        3.0        153     108.5  73.0
## 74    Passenger            69.725        8.0        450      96.2  75.7
## 75    Passenger            31.505        3.0        210     105.1  70.5
## 76    Passenger            21.975        3.1        175     109.0  72.7
## 77    Passenger            17.885        3.0        155     108.5  73.0
## 78    Passenger            29.465        3.0        227     108.3  70.2
## 79    Passenger            19.390        3.4        180     110.5  72.7
## 80    Passenger            24.495        2.5        168     106.0  69.2
## 81    Passenger            18.890        3.1        175     107.5  72.5
## 82    Passenger            26.249        3.0        222     108.3  70.3
## 83    Passenger            33.120        2.3        170     106.4  70.6
## 84    Passenger            28.800        2.4        168     104.9  69.3
```

```
## 85     Passenger            31.750         2.3        185     105.9  67.7
## 86           Car            20.550         2.0        146     103.2  68.9
## 87           Car            17.890         3.3        170     116.1  66.5
## 88     Passenger            41.600         3.2        215     105.9  67.8
## 89     Passenger            45.705         5.7        345     104.5  73.6
## 90     Passenger            27.500         2.4        168     104.9  69.3
## 91     Passenger            21.560         3.8        190     101.3  73.1
## 92     Passenger            33.400         2.8        193     107.3  68.5
## 93           Car            21.620         4.0        190     101.4  69.4
## 94     Passenger            26.990         2.5        170     107.3  68.4
## 95     Passenger            25.450         3.0        161      97.2  72.4
## 96           Car            20.095         2.5        165      99.4  68.3
## 97     Passenger            18.145         3.1        150     107.0  69.4
## 98     Passenger            19.720         3.4        175     107.0  70.4
## 99           Car            12.050         2.5        119     117.5  69.4
## 100    Passenger            19.990         2.0        115      97.4  66.7
## 101    Passenger            74.970         3.4        300      92.6  69.5
## 102    Passenger            18.835         2.2        137     106.5  69.0
## 103    Passenger            14.999         2.4        148     106.3  71.6
## 104    Passenger            20.230         2.5        168     108.0  71.0
## 105    Passenger            38.900         2.3        190      94.5  67.5
## 106    Passenger            16.535         3.1        170     107.0  69.4
## 107          Car            14.460         2.5        120      93.4  66.7
## 108    Passenger            21.200         1.8        150     106.4  68.5
## 109    Passenger            24.400         1.9        160     100.5  67.6
## 110    Passenger            71.020         3.4        300      92.6  69.5
## 111    Passenger            20.390         2.4        155     103.1  69.1
## 112    Passenger            23.990         1.8        150     102.6  68.2
## 113    Passenger            17.518         2.2        133     105.2  70.1
## 114    Passenger            23.400         1.9        160     100.5  67.6
## 115    Passenger            26.100         2.0        185     102.6  67.4
## 116    Passenger            41.000         2.3        185      94.5  67.5
## 117    Passenger            19.840         2.5        163     103.7  69.7
## 118    Passenger            18.270         2.4        150     107.0  70.1
## 119    Passenger            17.357         2.4        145     103.7  68.5
## 120    Passenger            16.080         2.0        132     108.0  71.0
## 121    Passenger            15.350         2.3        135     106.9  70.3
## 122    Passenger            16.480         2.0        132     108.0  71.0
## 123    Passenger            19.047         2.4        154     100.8  68.9
## 124    Passenger            15.010         2.2        137     106.5  69.0
## 125    Passenger            21.610         2.4        150     104.1  68.4
## 126    Passenger            16.540         2.0        125     106.4  69.6
## 127    Passenger            19.045         2.5        163     103.7  69.1
## 128    Passenger            16.700         2.0        115      98.9  68.3
## 129    Passenger            43.000         3.5        253     113.3  76.3
## 130    Passenger            41.430         2.7        217      95.2  70.1
## 131    Passenger            17.035         2.5        170     106.5  69.1
## 132    Passenger            16.240         2.0        125     106.5  69.1
## 133    Passenger            15.900         2.0        115      98.9  67.9
## 134    Passenger            14.900         2.0        115      98.9  68.3
## 135    Passenger            17.500         2.0        115      98.9  68.3
## 136    Passenger            13.260         2.2        115     104.1  67.9
## 137          Car            16.888         2.0        127      94.9  66.7
## 138    Passenger            21.500         1.8        140     101.2  67.3
```

```
## 139    Passenger            11.799         2.0        140     100.4  66.9
## 140    Passenger            13.499         1.8        126      99.8  67.3
## 141          Car            11.528         2.4        142     103.3  66.5
## 142    Passenger            12.640         2.0        132     105.0  74.4
## 143    Passenger            12.315         2.0        107     103.0  66.9
## 144    Passenger            12.640         2.0        132     105.0  74.4
## 145    Passenger            12.070         2.0        110      98.4  67.0
## 146    Passenger            14.290         1.9        124     102.4  66.4
## 147    Passenger            16.875         1.8        140     102.4  68.3
## 148    Passenger            13.108         1.8        120      97.0  66.7
## 149    Passenger            13.960         1.8        120      97.1  66.7
## 150    Passenger            12.535         1.9        100     102.4  66.4
## 151    Passenger            12.885         1.6        106     103.2  67.1
## 152    Passenger            10.685         1.9        100     102.4  66.4
## 153    Passenger            13.987         1.8        113      98.4  66.5
## 154    Passenger             9.699         1.5         92      96.1  65.7
## 155    Passenger             9.235         1.0         55      93.1  62.6
## 156    Passenger            44.475         4.6        275     112.2  75.0
## 157          Car             0.000          NA         NA        NA    NA
##     Length Curb_weight Fuel_capacity Fuel_efficiency Latest_Launch
## 1    201.2       5.572          30.0              15     4/17/2012
## 2    192.5       5.401          25.4              15    10/30/2012
## 3    204.8       5.393          30.0              15    12/23/2012
## 4    192.5       5.115          25.4              15     9/25/2011
## 5    204.6       4.808          26.0              16     9/14/2012
## 6    186.6       4.520          24.3              18     1/17/2012
## 7    224.2       4.470          26.0              17      03-06-12
## 8    193.5       4.394          25.0              17     6/27/2012
## 9    180.6       4.387          19.0              20      02-10-11
## 10   208.5       4.298          32.0              16     7/26/2012
## 11   201.2       4.288          20.0              23      02-08-12
## 12   192.6       4.245          32.0              15      01-06-12
## 13   224.5       4.241          25.1              18     8/16/2012
## 14   203.1       4.133          23.2              21     6/13/2011
## 15   177.1       4.125          21.1              20     3/17/2011
## 16   215.3       4.121          19.0              21      06-04-12
## 17   196.6       4.115          23.2              20      04-11-11
## 18   181.2       4.068          17.5              19     9/21/2011
## 19   194.8       3.991          20.0              21      03-07-11
## 20   207.2       3.978          18.5              22     2/23/2012
## 21   205.4       3.967          18.5              22     2/18/2011
## 22   212.0       3.958          19.0              21     7/24/2012
## 23   201.4       3.948          25.0              22     6/25/2011
## 24   182.6       3.947          21.0              19     9/25/2011
## 25   194.7       3.944          20.0              21    10/20/2009
## 26   201.3       3.942          25.0              23     7/22/2012
## 27   212.0       3.908          19.0              21     9/26/2011
## 28   198.2       3.902          23.7              21     2/27/2012
## 29   180.1       3.900          17.2              21      01-04-12
## 30   196.7       3.890          22.5              22     3/29/2012
## 31   181.5       3.880          20.5              19      12-10-11
## 32   190.7       3.876          21.0              19     4/25/2012
## 33   190.1       3.876          21.0              18     2/13/2008
## 34   208.5       3.868          20.0              22      08-03-12
```

```
## 35   178.2       3.857          21.1              19       10-09-12
## 36   196.6       3.850          18.0              22       03-10-11
## 37   200.6       3.843          19.0              22     11/27/2011
## 38   189.4       3.823          21.1              25       07-12-11
## 39   178.0       3.821          19.4              18      1/24/2011
## 40   206.8       3.778          18.5              24      3/23/2012
## 41   194.8       3.770          18.0              22      9/28/2011
## 42   200.9       3.761          26.0              21      2/25/2012
## 43   193.5       3.759          20.9              22       10-05-12
## 44   189.2       3.693          19.8              21     11/28/2012
## 45   191.3       3.650          18.4              21       11-03-12
## 46   189.2       3.638          19.8              23       05-10-12
## 47   185.7       3.601          18.5              23      4/26/2011
## 48   189.8       3.600          21.1              24     11/14/2011
## 49   200.0       3.591          17.5              25      7/23/2011
## 50   202.5       3.590          17.5              24      5/18/2011
## 51   197.8       3.567          17.0              23       02-10-12
## 52   207.7       3.564          17.0              23       05-08-12
## 53   192.0       3.561          18.5              22       08-09-11
## 54   215.0       3.557          22.0              19     11/25/2011
## 55   196.2       3.543          17.5              23       09-03-11
## 56   186.3       3.533          20.0              24       09-01-11
## 57   186.3       3.528          20.0              24      4/24/2011
## 58   192.9       3.517          17.2              25       06-03-11
## 59   178.3       3.510          19.5              20      5/18/2012
## 60   193.2       3.500          16.8              25     10/23/2011
## 61   193.4       3.492          16.8              25      6/16/2012
## 62   203.7       3.489          17.0              NA       06-02-12
## 63   188.0       3.472          18.5              25       04-04-11
## 64   192.0       3.470          17.2              26       01-04-12
## 65   195.9       3.455          18.0              NA       04-01-11
## 66   209.1       3.452          17.0              26       06-06-12
## 67   194.1       3.443          19.0              22      8/28/2012
## 68   183.3       3.440          18.5              23       03-07-11
## 69   191.9       3.417          18.5              26      8/31/2011
## 70   185.8       3.415          16.9              25       07-07-11
## 71   196.5       3.396          18.0              25     10/15/2012
## 72   200.0       3.389          17.0              27      6/18/2011
## 73   199.7       3.379          16.0              24      9/22/2012
## 74   176.7       3.375          19.0              16       08-07-11
## 75   190.2       3.373          18.5              23       07-09-12
## 76   194.6       3.368          17.5              25       11-02-11
## 77   197.6       3.368          16.0              24     12/20/2011
## 78   193.7       3.342          18.5              25      4/15/2012
## 79   197.9       3.340          17.0              27     12/22/2011
## 80   193.0       3.332          16.0              24     11/17/2011
## 81   200.9       3.330          16.6              25      5/24/2011
## 82   190.5       3.294          18.5              25       05-06-11
## 83   189.2       3.280          18.5              23       11-09-12
## 84   186.2       3.259          17.9              25      6/25/2011
## 85   177.4       3.250          16.4              26      4/24/2011
## 86   177.6       3.219          15.3              24      3/21/2012
## 87   196.1       3.217          19.4              18      8/27/2011
## 88   180.3       3.213          16.4              26       07-08-11
```

```
## 89   179.7       3.210          19.1              22       05-12-12
## 90   185.9       3.208          17.9              25     11/24/2012
## 91   183.2       3.203          15.7              24      1/31/2012
## 92   176.0       3.197          16.6              24      1/29/2012
## 93   167.5       3.194          20.0              20       10-05-12
## 94   176.0       3.179          16.6              26      6/28/2011
## 95   180.3       3.131          19.8              21      6/29/2012
## 96   175.2       3.125          15.9              24       09-10-12
## 97   192.0       3.102          15.2              25      5/31/2011
## 98   186.3       3.091          15.2              25     11/26/2012
## 99   200.7       3.086          20.0              23      1/14/2012
## 100  160.4       3.079          13.7              26      5/31/2011
## 101  174.5       3.075          17.0              23       07-11-11
## 102  190.4       3.075          13.1              27       08-05-11
## 103  185.4       3.072          17.2              25      6/14/2012
## 104  186.0       3.058          16.0              24     10/31/2011
## 105  157.9       3.055          15.9              26      1/16/2011
## 106  190.4       3.051          15.0              25      3/19/2012
## 107  152.0       3.045          19.0              17       03-04-12
## 108  184.1       3.043          16.4              27     10/30/2012
## 109  176.6       3.042          15.8              25      9/21/2011
## 110  174.5       3.032          17.0              21     12/21/2012
## 111  183.5       3.012          15.9              25       08-02-11
## 112  178.0       2.998          16.4              27       10-08-11
## 113  188.5       2.998          18.5              27       02-10-11
## 114  176.6       2.998          15.8              25      2/18/2011
## 115  182.2       2.990          16.9              23       06-12-11
## 116  157.3       2.975          14.0              27       08-06-11
## 117  190.9       2.967          15.9              24      1/16/2012
## 118  186.7       2.958          15.0              27     10/20/2009
## 119  187.8       2.945          16.3              25      1/29/2012
## 120  186.3       2.942          16.0              27     11/14/2011
## 121  188.8       2.932          17.1              27      5/20/2012
## 122  186.0       2.911          16.0              27       10-06-11
## 123  175.4       2.910          15.9              24     11/24/2012
## 124  190.4       2.910          13.1              28       12-04-12
## 125  181.9       2.906          15.0              27      1/25/2012
## 126  185.0       2.892          16.0              30      2/23/2012
## 127  190.2       2.879          15.9              24       07-01-12
## 128  172.3       2.853          14.5              26      8/27/2011
## 129  165.4       2.850          12.0              21      6/27/2012
## 130  171.0       2.778          17.0              22      2/19/2012
## 131  184.6       2.769          15.0              25      8/20/2012
## 132  184.8       2.769          15.0              28     12/19/2012
## 133  161.1       2.769          14.5              26     10/20/2011
## 134  163.3       2.767          14.5              26      1/24/2011
## 135  163.3       2.762          14.6              26       04-01-11
## 136  180.9       2.676          14.3              27      8/17/2011
## 137  163.8       2.668          15.3              27       05-06-11
## 138  172.4       2.639          13.2              28       02-02-12
## 139  174.0       2.626          14.5              27     11/15/2011
## 140  177.5       2.593          13.2              30      8/31/2011
## 141  178.7       2.580          15.1              23       08-01-11
## 142  174.4       2.567          12.5              29       12-12-11
```

```
## 143  174.8       2.564          13.2              30     7/22/2012
## 144  174.4       2.559          12.5              29     4/26/2011
## 145  174.7       2.468          12.7              30     3/31/2012
## 146  176.9       2.452          12.1              31     1/15/2011
## 147  170.5       2.425          14.5              31    12/29/2012
## 148  174.0       2.420          13.2              33      04-11-11
## 149  174.3       2.398          13.2              33      09-11-11
## 150  180.0       2.367          12.1              33     3/16/2011
## 151  175.1       2.339          11.9              32    10/21/2011
## 152  176.9       2.332          12.1              33     8/16/2012
## 153  173.6       2.250          13.2              30     4/23/2012
## 154  166.7       2.240          11.9              31      09-10-12
## 155  149.4       1.895          10.3              45     4/13/2012
## 156  201.0          NA          18.5              22     4/29/2011
## 157     NA          NA            NA              NA     7/13/2011
##     Power_perf_factor Fuel_capacitynew
## 1           109.50912              90.0
## 2           105.76046              76.2
## 3           123.97205              90.0
## 4           102.52898              76.2
## 5           100.02480              78.0
## 6            83.92082              72.9
## 7            90.21170              78.0
## 8            92.85413              75.0
## 9            90.49553              57.0
## 10           70.07832              96.0
## 11           85.21769              60.0
## 12           71.13529              96.0
## 13           89.40193              75.3
## 14          125.27388              69.6
## 15          139.98229              63.3
## 16           93.95792              57.0
## 17          141.10098              69.6
## 18           80.51167              52.5
## 19           71.17166              60.0
## 20          113.85460              55.5
## 21          103.44169              55.5
## 22           80.65770              57.0
## 23           76.09657              75.0
## 24           72.29036              63.0
## 25           69.67146              60.0
## 26           76.20844              75.0
## 27           80.49954              57.0
## 28          134.65686              71.1
## 29           91.94380              51.6
## 30          124.44672              67.5
## 31           80.38778              61.5
## 32           87.63550              63.0
## 33           85.94974              63.0
## 34          113.54021              60.0
## 35           83.60250              63.3
## 36           91.38978              54.0
## 37          113.76587              57.0
## 38           98.24974              63.3
```

```
## 39          69.78294           58.2
## 40          85.82841           55.5
## 41          83.48309           54.0
## 42          62.09505           78.0
## 43          78.02722           62.7
## 44         125.01336           59.4
## 45         102.17898           55.2
## 46          94.94670           59.4
## 47         101.62336           55.5
## 48          85.73565           63.3
## 49          84.25453           52.5
## 50          82.66136           52.5
## 51         101.65524           51.0
## 52         101.32928           51.0
## 53          84.56511           55.5
## 54          49.64500           66.0
## 55          95.63670           52.5
## 56          61.22700           60.0
## 57          60.95119           60.0
## 58          91.37078           51.6
## 59          70.66094           58.5
## 60          81.11854           50.4
## 61          81.49273           50.4
## 62          80.83147           51.0
## 63          83.99872           55.5
## 64                NA           51.6
## 65          86.27252           54.0
## 66          80.02378           51.0
## 67          84.83078           57.0
## 68          62.35558           55.5
## 69          84.91190           55.5
## 70          67.76591           50.7
## 71          78.31817           54.0
## 72          71.83804           51.0
## 73          62.23997           48.0
## 74         188.14432           57.0
## 75          87.21100           55.5
## 76          71.18145           52.5
## 77          62.50374           48.0
## 78          92.43689           55.5
## 79          72.03092           51.0
## 80          69.52136           48.0
## 81          69.99140           49.8
## 82          89.42782           55.5
## 83          73.50378           55.5
## 84          71.15598           53.7
## 85          78.28073           49.2
## 86          60.08797           45.9
## 87          67.88927           58.2
## 88          92.92579           49.2
## 89         141.14115           57.3
## 90          70.65450           53.7
## 91          76.50918           47.1
## 92          81.87707           49.8
```

```
## 93          76.58444          60.0
## 94          71.19121          49.8
## 95          67.54415          59.4
## 96          66.76294          47.7
## 97          60.86161          45.6
## 98          70.38974          45.6
## 99          47.38953          60.0
## 100         48.90737          41.1
## 101        135.91471          51.0
## 102         56.29524          39.3
## 103         58.75825          51.6
## 104         67.87611          48.0
## 105         82.80736          47.7
## 106         67.31446          45.0
## 107         48.67290          57.0
## 108         61.70138          49.2
## 109         66.49881          47.4
## 110        134.39098          51.0
## 111         63.31373          47.7
## 112         62.77764          49.2
## 113         54.37242          55.5
## 114         66.11306          47.4
## 115         76.02305          50.7
## 116         81.84897          42.0
## 117         65.95718          47.7
## 118         60.72745          45.0
## 119         58.60677          48.9
## 120         53.41190          48.0
## 121         54.26955          51.3
## 122         53.56620          48.0
## 123         62.44196          47.7
## 124         54.81973          39.3
## 125         62.01587          45.0
## 126         51.11347          48.0
## 127         65.65051          47.7
## 128         47.63824          43.5
## 129        106.98446          36.0
## 130         93.43733          51.0
## 131         67.35101          45.0
## 132         50.99775          45.0
## 133         47.32963          43.5
## 134         46.94388          43.5
## 135         47.94684          43.8
## 136         46.36335          42.9
## 137         51.95511          45.9
## 138         58.28015          39.6
## 139         54.59005          43.5
## 140         50.24198          39.6
## 141         55.29712          45.3
## 142         52.08490          37.5
## 143         43.11713          39.6
## 144         52.08490          37.5
## 145         44.08371          38.1
## 146         49.86577          36.3
```

```
## 147          56.49603             43.5
## 148          47.96897             39.6
## 149          48.29764             39.6
## 150          40.70007             36.3
## 151          42.87910             35.7
## 152          39.98642             36.3
## 153          45.83218             39.6
## 154          36.67228             35.7
## 155          23.27627             30.9
## 156         115.62136             55.5
## 157                NA               NA
```

```
## Sorting Field Curb_Weight in descending order
```

Rename some of the column names

```
names(Car.Sales.1)[names(Car.Sales.1) == "Vehicle_type"]<-"vehicle_model"
## Renaming vehicle type to Vehicle model
```

Add new variables in your data frame by using a mathematical function

```
Car.Sales.1$Horsepowernew = Car.Sales.1$Horsepower*0.5
```

Create a training set using random number generator engine

```
set.seed(1234)
Car.Sales.1%>% sample_n (5, replace = FALSE)
```

```
##   Manufacturer   Model Sales_in_thousands X__year_resale_value vehicle_model
## 1    Chevrolet  Impala            107.995                   NA     Passenger
## 2   Mitsubishi  Mirage             26.232                8.325     Passenger
## 3   Volkswagen     GTI              5.596               13.760     Passenger
## 4   Mercedes-B M-Class             28.976                   NA           Car
## 5   Oldsmobile   Alero             80.255                   NA     Passenger
##   Price_in_thousands Engine_size Horsepower Wheelbase Width Length Curb_weight
## 1             18.890         3.4        180     110.5  73.0  200.0       3.389
## 2             13.987         1.8        113      98.4  66.5  173.6       2.250
## 3             17.500         2.0        115      98.9  68.3  163.3       2.762
## 4             35.300         3.2        215     111.0  72.2  180.6       4.387
## 5             18.270         2.4        150     107.0  70.1  186.7       2.958
##   Fuel_capacity Fuel_efficiency Latest_Launch Power_perf_factor
## 1          17.0              27     6/18/2011          71.83804
## 2          13.2              30     4/23/2012          45.83218
## 3          14.6              26      04-01-11          47.94684
## 4          19.0              20      02-10-11          90.49553
## 5          15.0              27    10/20/2009          60.72745
##   Fuel_capacitynew Horsepowernew
```

```
## 1             51.0          90.0
## 2             39.6          56.5
## 3             43.8          57.5
## 4             57.0         107.5
## 5             45.0          75.0
```

Print the summary statistics

```
Car.Sales.1 %>% group_by (Manufacturer) %>% summarise(mean(Price_in_thousands))
```

```
## # A tibble: 30 x 2
##    Manufacturer `mean(Price_in_thousands)`
##    <chr>                             <dbl>
##  1 Acura                              23.0
##  2 Audi                               40.0
##  3 BMW                                33.1
##  4 Buick                              26.8
##  5 Cadillac                           40.3
##  6 Chevrolet                          20.0
##  7 Chrysler                           20.1
##  8 Dodge                              24.2
##  9 Ford                               21.0
## 10 Honda                              20.3
## # ... with 20 more rows
```

Calculate Mean

```
mean(Car.Sales.1$Sales_in_thousands)
```

```
## [1] 52.99808
```

Calculate Median

```
median(Car.Sales.1$Sales_in_thousands)
```

```
## [1] 29.45
```

Calculate Mode

```
mode(Car.Sales.1$Sales_in_thousands)
```

```
## [1] "numeric"
```

Calculate Range

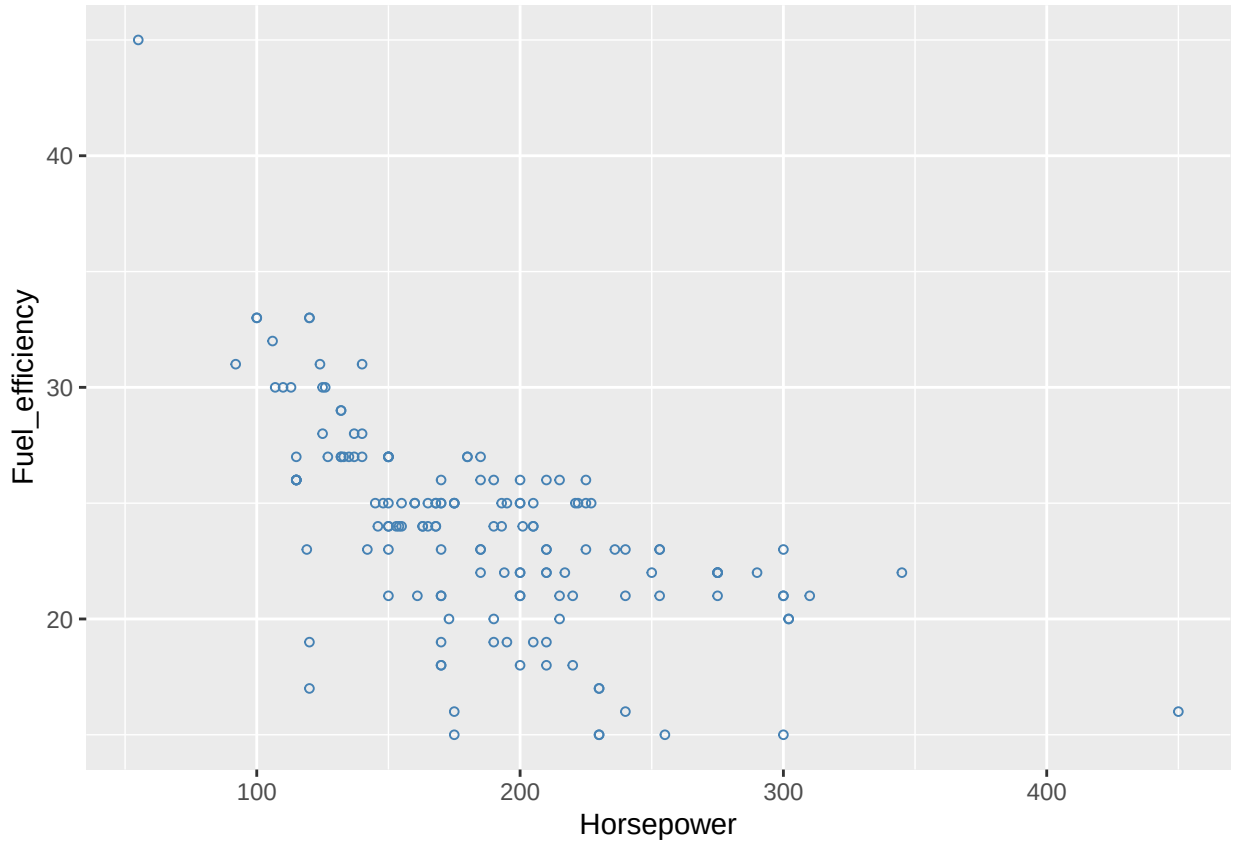
```
range(Car.Sales.1$Sales_in_thousands)
```

```
## [1]   0.110 540.561
```

Scatter plot

```
ggplot(data = Car.Sales.1, aes(x = Horsepower, y = Fuel_efficiency))+geom_point(size=1.2, color ="steell
```

```
## Warning: Removed 3 rows containing missing values (geom_point).
```

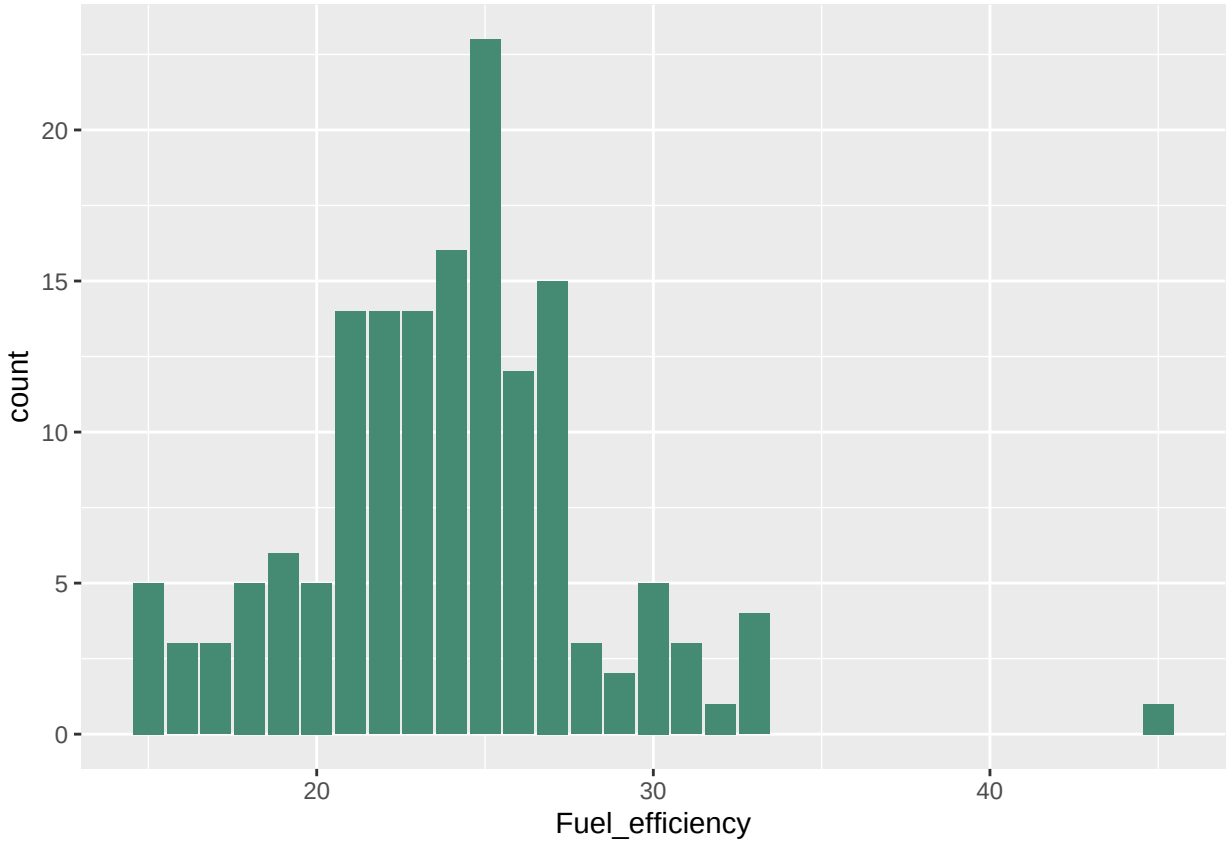



```
## Scatter plot of Horsepower vs Fuel efficiency
```

Bar plot

```
ggplot(data = Car.Sales.1, aes(x = Fuel_efficiency))+geom_bar(fill = "aquamarine4")
```

```
## Warning: Removed 3 rows containing non-finite values (stat_count).
```




```
## Barplot of Fuelefficiency
```

Find the correlation

```
y = Car.Sales.1[,"Sales_in_thousands"]

x = Car.Sales.1[,"Price_in_thousands"]

corr2 = cor(x,y, method = "pearson")

corr2
```

```
## [1] -0.2907503
```

```
## correlation between sales_in_thousands and price_in_thousands,
```

Conclusion

After performing the analysis of the Car sales dataset, it is clear that correlation between sales vs price is negative meaning the price and sales are inversely proportional to each other. The sales price of car ranges from 0.110 to 540.651 (in thousands) and the mean sale value is 52.99808 (in thousands). The mean price in thousands for Porsche is 62.47 (highest) while for Saturn is 14.27 (lowest).

##Repository Link: https://github.com/Pallu2812/Group5.git