Module 1: Import the dataset

Importing libraries

```
import pandas as pd
import numpy as np
from matplotlib import pyplot as plt
import seaborn as sns
from scipy import stats as stats
```

Importing the dataset 'auto.csv'

```
auto = pd.read_csv('auto.csv',header=None)
```

Displaying top and bottom rows

```
auto.head(7)
```

```
   0    1            2    3    4     5            6    7      8      9
...  \
0   3    ?  alfa-romero  gas  std   two  convertible  rwd  front
88.6  ...
1   3    ?  alfa-romero  gas  std   two  convertible  rwd  front
88.6  ...
2   1    ?  alfa-romero  gas  std   two    hatchback  rwd  front
94.5  ...
3   2  164         audi  gas  std  four        sedan  fwd  front
99.8  ...
4   2  164         audi  gas  std  four        sedan  4wd  front
99.4  ...
5   2    ?         audi  gas  std   two        sedan  fwd  front
99.8  ...
6   1  158         audi  gas  std  four        sedan  fwd  front
105.8  ...

    16    17    18    19    20   21    22  23  24     25
0  130  mpfi  3.47  2.68   9.0  111  5000  21  27  13495
1  130  mpfi  3.47  2.68   9.0  111  5000  21  27  16500
2  152  mpfi  2.68  3.47   9.0  154  5000  19  26  16500
3  109  mpfi  3.19  3.40  10.0  102  5500  24  30  13950
4  136  mpfi  3.19  3.40   8.0  115  5500  18  22  17450
5  136  mpfi  3.19  3.40   8.5  110  5500  19  25  15250
6  136  mpfi  3.19  3.40   8.5  110  5500  19  25  17710

[7 rows x 26 columns]
```

```
auto.tail(7)
```

```
     0    1      2       3      4     5      6    7      8
9   ...   16  \
198  -2  103  volvo     gas  turbo  four  sedan  rwd  front
104.3  ...  130
199  -1   74  volvo     gas  turbo  four  wagon  rwd  front
104.3  ...  130
200  -1   95  volvo     gas    std  four  sedan  rwd  front
109.1  ...  141
201  -1   95  volvo     gas  turbo  four  sedan  rwd  front
109.1  ...  141
202  -1   95  volvo     gas    std  four  sedan  rwd  front
109.1  ...  173
203  -1   95  volvo  diesel  turbo  four  sedan  rwd  front
109.1  ...  145
204  -1   95  volvo     gas  turbo  four  sedan  rwd  front
109.1  ...  141

       17    18    19    20   21    22  23  24     25
198  mpfi  3.62  3.15   7.5  162  5100  17  22  18420
199  mpfi  3.62  3.15   7.5  162  5100  17  22  18950
200  mpfi  3.78  3.15   9.5  114  5400  23  28  16845
201  mpfi  3.78  3.15   8.7  160  5300  19  25  19045
202  mpfi  3.58  2.87   8.8  134  5500  18  23  21485
203   idi  3.01  3.40  23.0  106  4800  26  27  22470
204  mpfi  3.78  3.15   9.5  114  5400  19  25  22625

[7 rows x 26 columns]
```

Adding the column headers

```
# we have the heading for the columns separately available so here we
define the variable headers and proceed with it

headers = ['symboling','normalized-losses','make','fuel-
type','aspiration','num-of-doors','body-style',
           'drive-wheels','engine-location','wheel-
base','length','width','height','curb-weight','engine-type',
           'num-of-cylinders','engine-size','fuel-
system','bore','stroke','compression-ratio','horsepower',
           'peak-rpm','city-mpg','highway-mpg','price']

auto.columns = headers
```

Display the top 5 records

```
auto.head()

   symboling normalized-losses         make fuel-type aspiration num-
of-doors  \
```

```
0           3                  ?  alfa-romero       gas        std
two
1           3                  ?  alfa-romero       gas        std
two
2           1                  ?  alfa-romero       gas        std
two
3           2                164         audi       gas        std
four
4           2                164         audi       gas        std
four

    body-style drive-wheels engine-location  wheel-base  ...  engine-
size  \
0  convertible          rwd           front        88.6  ...
130
1  convertible          rwd           front        88.6  ...
130
2    hatchback          rwd           front        94.5  ...
152
3        sedan          fwd           front        99.8  ...
109
4        sedan          4wd           front        99.4  ...
136

   fuel-system  bore  stroke compression-ratio horsepower  peak-rpm
city-mpg  \
0         mpfi  3.47    2.68               9.0        111      5000
21
1         mpfi  3.47    2.68               9.0        111      5000
21
2         mpfi  2.68    3.47               9.0        154      5000
19
3         mpfi  3.19    3.40              10.0        102      5500
24
4         mpfi  3.19    3.40               8.0        115      5500
18

  highway-mpg  price
0          27  13495
1          27  16500
2          26  16500
3          30  13950
4          22  17450

[5 rows x 26 columns]
```

Saving the file

```
auto.to_csv('automobile.csv',index=False)
```

Checking the data types

```
auto.dtypes
```

```
symboling              int64
normalized-losses     object
make                  object
fuel-type             object
aspiration            object
num-of-doors          object
body-style            object
drive-wheels          object
engine-location       object
wheel-base           float64
length               float64
width                float64
height               float64
curb-weight            int64
engine-type           object
num-of-cylinders      object
engine-size            int64
fuel-system           object
bore                  object
stroke                object
compression-ratio    float64
horsepower            object
peak-rpm              object
city-mpg               int64
highway-mpg            int64
price                 object
dtype: object
```

Describe the dataframe & look the statistical information

```
auto.describe()
```

```
        symboling  wheel-base      length       width      height  \
count  205.000000  205.000000  205.000000  205.000000  205.000000
mean     0.834146   98.756585  174.049268   65.907805   53.724878
std      1.245307    6.021776   12.337289    2.145204    2.443522
min     -2.000000   86.600000  141.100000   60.300000   47.800000
25%      0.000000   94.500000  166.300000   64.100000   52.000000
50%      1.000000   97.000000  173.200000   65.500000   54.100000
75%      2.000000  102.400000  183.100000   66.900000   55.500000
max      3.000000  120.900000  208.100000   72.300000   59.800000

       curb-weight  engine-size  compression-ratio    city-mpg
highway-mpg
count   205.000000   205.000000         205.000000  205.000000
205.000000
```

```
mean   2555.565854   126.907317          10.142537   25.219512
30.751220
std     520.680204    41.642693           3.972040    6.542142
6.886443
min    1488.000000    61.000000           7.000000   13.000000
16.000000
25%    2145.000000    97.000000           8.600000   19.000000
25.000000
50%    2414.000000   120.000000           9.000000   24.000000
30.000000
75%    2935.000000   141.000000           9.400000   30.000000
34.000000
max    4066.000000   326.000000          23.000000   49.000000
54.000000
```

```
auto.describe(include='all')
```

```
         symboling normalized-losses    make fuel-type aspiration  \
count   205.000000               205     205       205        205
unique         NaN                52      22         2          2
top            NaN                 ?  toyota       gas        std
freq           NaN                41      32       185        168
mean      0.834146               NaN     NaN       NaN        NaN
std       1.245307               NaN     NaN       NaN        NaN
min      -2.000000               NaN     NaN       NaN        NaN
25%       0.000000               NaN     NaN       NaN        NaN
50%       1.000000               NaN     NaN       NaN        NaN
75%       2.000000               NaN     NaN       NaN        NaN
max       3.000000               NaN     NaN       NaN        NaN

       num-of-doors body-style drive-wheels engine-location  wheel-
base  ...  \
count           205        205          205             205
205.000000  ...
unique            3          5            3               2
NaN  ...
top            four      sedan          fwd           front
NaN  ...
freq            114         96          120             202
NaN  ...
mean            NaN        NaN          NaN             NaN
98.756585  ...
std             NaN        NaN          NaN             NaN
6.021776  ...
min             NaN        NaN          NaN             NaN
86.600000  ...
25%             NaN        NaN          NaN             NaN
94.500000  ...
50%             NaN        NaN          NaN             NaN
97.000000  ...
```

```
75%              NaN        NaN          NaN              NaN
102.400000  ...
max              NaN        NaN          NaN              NaN
120.900000  ...

        engine-size  fuel-system  bore  stroke compression-ratio
horsepower  \
count    205.000000          205   205     205        205.000000
205
unique          NaN            8    39      37               NaN
60
top             NaN         mpfi  3.62    3.40               NaN
68
freq            NaN           94    23      20               NaN
19
mean     126.907317          NaN   NaN     NaN         10.142537
NaN
std       41.642693          NaN   NaN     NaN          3.972040
NaN
min       61.000000          NaN   NaN     NaN          7.000000
NaN
25%       97.000000          NaN   NaN     NaN          8.600000
NaN
50%      120.000000          NaN   NaN     NaN          9.000000
NaN
75%      141.000000          NaN   NaN     NaN          9.400000
NaN
max      326.000000          NaN   NaN     NaN         23.000000
NaN

        peak-rpm    city-mpg highway-mpg price
count         205  205.000000  205.000000   205
unique         24         NaN         NaN   187
top          5500         NaN         NaN     ?
freq           37         NaN         NaN     4
mean          NaN   25.219512   30.751220   NaN
std           NaN    6.542142    6.886443   NaN
min           NaN   13.000000   16.000000   NaN
25%           NaN   19.000000   25.000000   NaN
50%           NaN   24.000000   30.000000   NaN
75%           NaN   30.000000   34.000000   NaN
max           NaN   49.000000   54.000000   NaN

[11 rows x 26 columns]
```

As you can see we have most of the columns here filled with null values and we will be looking into that problem soon

Getting the summary of the dataframe

```
auto.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 205 entries, 0 to 204
Data columns (total 26 columns):
 #   Column             Non-Null Count  Dtype  
---  ------             --------------  -----  
 0   symboling          205 non-null    int64  
 1   normalized-losses  205 non-null    object 
 2   make               205 non-null    object 
 3   fuel-type          205 non-null    object 
 4   aspiration         205 non-null    object 
 5   num-of-doors       205 non-null    object 
 6   body-style         205 non-null    object 
 7   drive-wheels       205 non-null    object 
 8   engine-location    205 non-null    object 
 9   wheel-base         205 non-null    float64
 10  length             205 non-null    float64
 11  width              205 non-null    float64
 12  height             205 non-null    float64
 13  curb-weight        205 non-null    int64  
 14  engine-type        205 non-null    object 
 15  num-of-cylinders   205 non-null    object 
 16  engine-size        205 non-null    int64  
 17  fuel-system        205 non-null    object 
 18  bore               205 non-null    object 
 19  stroke             205 non-null    object 
 20  compression-ratio  205 non-null    float64
 21  horsepower         205 non-null    object 
 22  peak-rpm           205 non-null    object 
 23  city-mpg           205 non-null    int64  
 24  highway-mpg        205 non-null    int64  
 25  price              205 non-null    object 
dtypes: float64(5), int64(5), object(16)
memory usage: 41.8+ KB
```

Module 2: Data Warngling or data cleaning

```
auto.head()
```

```
   symboling normalized-losses         make fuel-type aspiration num-
of-doors  \
0          3                  ?  alfa-romero       gas        std
two
1          3                  ?  alfa-romero       gas        std
two
```

```
2          1                  ?  alfa-romero       gas        std
two
3          2                164         audi       gas        std
four
4          2                164         audi       gas        std
four

    body-style drive-wheels engine-location  wheel-base  ...  engine-
size  \
0  convertible          rwd           front        88.6  ...
130
1  convertible          rwd           front        88.6  ...
130
2    hatchback          rwd           front        94.5  ...
152
3        sedan          fwd           front        99.8  ...
109
4        sedan          4wd           front        99.4  ...
136

   fuel-system  bore  stroke compression-ratio horsepower  peak-rpm
city-mpg  \
0         mpfi  3.47    2.68               9.0        111      5000
21
1         mpfi  3.47    2.68               9.0        111      5000
21
2         mpfi  2.68    3.47               9.0        154      5000
19
3         mpfi  3.19    3.40              10.0        102      5500
24
4         mpfi  3.19    3.40               8.0        115      5500
18

  highway-mpg  price
0          27  13495
1          27  16500
2          26  16500
3          30  13950
4          22  17450

[5 rows x 26 columns]
```

```
# Here we check if there is any cell in the data where there is a null
values at all
auto.isna().sum()
```

```
symboling            0
normalized-losses    0
make                 0
fuel-type            0
```

```
aspiration            0
num-of-doors          0
body-style            0
drive-wheels          0
engine-location       0
wheel-base            0
length                0
width                 0
height                0
curb-weight           0
engine-type           0
num-of-cylinders      0
engine-size           0
fuel-system           0
bore                  0
stroke                0
compression-ratio     0
horsepower            0
peak-rpm              0
city-mpg              0
highway-mpg           0
price                 0
dtype: int64
```

```
# replacing '?' with null values
auto.replace('?',np.nan,inplace=True)

auto.isna().sum()
```

```
symboling             0
normalized-losses    41
make                  0
fuel-type             0
aspiration            0
num-of-doors          2
body-style            0
drive-wheels          0
engine-location       0
wheel-base            0
length                0
width                 0
height                0
curb-weight           0
engine-type           0
num-of-cylinders      0
engine-size           0
fuel-system           0
bore                  4
stroke                4
compression-ratio     0
```

```
horsepower            2
peak-rpm              2
city-mpg              0
highway-mpg           0
price                 4
dtype: int64
```

Here we have finally got how many null values we have and in which all columns it is more occurring

```
auto['make'].unique()
```

```
array(['alfa-romero', 'audi', 'bmw', 'chevrolet', 'dodge', 'honda',
       'isuzu', 'jaguar', 'mazda', 'mercedes-benz', 'mercury',
       'mitsubishi', 'nissan', 'peugot', 'plymouth', 'porsche',
'renault',
       'saab', 'subaru', 'toyota', 'volkswagen', 'volvo'],
dtype=object)
```

```
auto.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 205 entries, 0 to 204
Data columns (total 26 columns):
 #   Column             Non-Null Count  Dtype
---  ------             --------------  -----
 0   symboling          205 non-null    int64
 1   normalized-losses  164 non-null    object
 2   make               205 non-null    object
 3   fuel-type          205 non-null    object
 4   aspiration         205 non-null    object
 5   num-of-doors       203 non-null    object
 6   body-style         205 non-null    object
 7   drive-wheels       205 non-null    object
 8   engine-location    205 non-null    object
 9   wheel-base         205 non-null    float64
 10  length             205 non-null    float64
 11  width              205 non-null    float64
 12  height             205 non-null    float64
 13  curb-weight        205 non-null    int64
 14  engine-type        205 non-null    object
 15  num-of-cylinders   205 non-null    object
 16  engine-size        205 non-null    int64
 17  fuel-system        205 non-null    object
 18  bore               201 non-null    object
 19  stroke             201 non-null    object
 20  compression-ratio  205 non-null    float64
 21  horsepower         203 non-null    object
 22  peak-rpm           203 non-null    object
 23  city-mpg           205 non-null    int64
```

```
 24  highway-mpg        205 non-null    int64
 25  price              201 non-null    object
dtypes: float64(5), int64(5), object(16)
memory usage: 41.8+ KB
```

```
# change the dtype of normalized column into int and fill the empty
cells with zero
auto['normalized-losses'] = auto['normalized-
losses'].fillna(0).astype(int)

auto['price'] = auto['price'].fillna(0).astype(int)

auto['price'].dtype
```

```
dtype('int32')
```

Before proceeding to the next section, it is essential to address the missing values. Standard imputation techniques involve using the mean, median, or mode; however, I implemented a more tailored approach. Specifically, the imputation process was customized based on the vehicle make, which, although exhaustive and time-consuming, was intended to enhance model accuracy significantly. Each vehicle make had its own specific mean, median, and mode calculated.

This data alteration is entirely customized and, while beneficial for accuracy, is not generally recommended due to its time-intensive nature.

Alfa-romero

```
auto[auto['make']=='alfa-romero']
```

```
   symboling  normalized-losses         make fuel-type aspiration  \
0          3                  0  alfa-romero       gas        std
1          3                  0  alfa-romero       gas        std
2          1                  0  alfa-romero       gas        std

  num-of-doors   body-style drive-wheels engine-location  wheel-
base  ...  \
0          two  convertible          rwd           front
88.6  ...
1          two  convertible          rwd           front
88.6  ...
2          two    hatchback          rwd           front
94.5  ...

   engine-size  fuel-system  bore  stroke compression-ratio horsepower
\
0          130         mpfi  3.47    2.68               9.0        111

1          130         mpfi  3.47    2.68               9.0        111
```

```
2          152          mpfi  2.68    3.47                9.0         154


   peak-rpm city-mpg highway-mpg  price
0      5000       21          27  13495
1      5000       21          27  16500
2      5000       19          26  16500

[3 rows x 26 columns]
```

For the make Alfa Romera we have found zero missing values and zero null values so we proceed to the next make

Audi

```
auto[auto['make']=='audi']
```

```
   symboling  normalized-losses  make fuel-type aspiration num-of-
doors  \
3          2                164  audi       gas        std
four
4          2                164  audi       gas        std
four
5          2                  0  audi       gas        std
two
6          1                158  audi       gas        std
four
7          1                  0  audi       gas        std
four
8          1                158  audi       gas      turbo
four
9          0                  0  audi       gas      turbo
two

  body-style drive-wheels engine-location  wheel-base  ...  engine-
size  \
3      sedan          fwd           front        99.8  ...
109
4      sedan          4wd           front        99.4  ...
136
5      sedan          fwd           front        99.8  ...
136
6      sedan          fwd           front       105.8  ...
136
7      wagon          fwd           front       105.8  ...
136
8      sedan          fwd           front       105.8  ...
```

```
131
9  hatchback          4wd           front        99.5  ...
131

   fuel-system  bore  stroke compression-ratio horsepower  peak-rpm
city-mpg  \
3         mpfi  3.19    3.40              10.0        102      5500
24
4         mpfi  3.19    3.40               8.0        115      5500
18
5         mpfi  3.19    3.40               8.5        110      5500
19
6         mpfi  3.19    3.40               8.5        110      5500
19
7         mpfi  3.19    3.40               8.5        110      5500
19
8         mpfi  3.13    3.40               8.3        140      5500
17
9         mpfi  3.13    3.40               7.0        160      5500
16

  highway-mpg  price
3          30  13950
4          22  17450
5          25  15250
6          25  17710
7          25  18920
8          20  23875
9          22      0

[7 rows x 26 columns]
```

Here we have 3 zero values for AUDI in the normalized-lossess column we will solve this by filling it with its median and handle the price at the end to be zero situation

```
# finding the median of the column normalized-losses with the make to
be Audi
audi_nrml_ls_median = auto[auto['make']=='audi']['normalized-
losses'].median()

audi_nrml_ls_median

158.0

# audi_normalized_losses = 0 = median

auto.loc[(auto['make']=='audi') & (auto['normalized-losses']==0),
         'normalized-losses']  = int(audi_nrml_ls_median)
```

```
# df[(df['make'] == 'audi') & (df['normalized-losses'] == 0)]

auto.dropna(subset=['price'],inplace=True)

auto.drop(auto[auto['price']==0].index,axis=0,inplace=True)

auto[auto['make']=='audi']
```

```
   symboling  normalized-losses  make fuel-type aspiration num-of-
doors  \
3          2                164  audi       gas        std
four
4          2                164  audi       gas        std
four
5          2                158  audi       gas        std
two
6          1                158  audi       gas        std
four
7          1                158  audi       gas        std
four
8          1                158  audi       gas      turbo
four

  body-style drive-wheels engine-location  wheel-base  ...  engine-
size  \
3      sedan          fwd           front        99.8  ...
109
4      sedan          4wd           front        99.4  ...
136
5      sedan          fwd           front        99.8  ...
136
6      sedan          fwd           front       105.8  ...
136
7      wagon          fwd           front       105.8  ...
136
8      sedan          fwd           front       105.8  ...
131

   fuel-system  bore  stroke compression-ratio horsepower  peak-rpm
city-mpg  \
3         mpfi  3.19    3.40              10.0        102      5500
24
4         mpfi  3.19    3.40               8.0        115      5500
18
5         mpfi  3.19    3.40               8.5        110      5500
19
6         mpfi  3.19    3.40               8.5        110      5500
19
7         mpfi  3.19    3.40               8.5        110      5500
```

```
19
8         mpfi  3.13    3.40               8.3        140      5500
17

  highway-mpg  price
3          30  13950
4          22  17450
5          25  15250
6          25  17710
7          25  18920
8          20  23875

[6 rows x 26 columns]
```

BMW

```
auto[auto['make']=='bmw']

    symboling  normalized-losses make fuel-type aspiration num-of-
doors  \
10          2                192  bmw       gas        std
two
11          0                192  bmw       gas        std
four
12          0                188  bmw       gas        std
two
13          0                188  bmw       gas        std
four
14          1                  0  bmw       gas        std
four
15          0                  0  bmw       gas        std
four
16          0                  0  bmw       gas        std
two
17          0                  0  bmw       gas        std
four

   body-style drive-wheels engine-location  wheel-base  ...  engine-
size  \
10      sedan          rwd           front       101.2  ...
108
11      sedan          rwd           front       101.2  ...
108
12      sedan          rwd           front       101.2  ...
164
13      sedan          rwd           front       101.2  ...
164
14      sedan          rwd           front       103.5  ...
```

```
164
15      sedan           rwd           front       103.5  ...
209
16      sedan           rwd           front       103.5  ...
209
17      sedan           rwd           front       110.0  ...
209

    fuel-system  bore  stroke compression-ratio horsepower  peak-rpm
city-mpg  \
10         mpfi  3.50    2.80               8.8        101      5800
23
11         mpfi  3.50    2.80               8.8        101      5800
23
12         mpfi  3.31    3.19               9.0        121      4250
21
13         mpfi  3.31    3.19               9.0        121      4250
21
14         mpfi  3.31    3.19               9.0        121      4250
20
15         mpfi  3.62    3.39               8.0        182      5400
16
16         mpfi  3.62    3.39               8.0        182      5400
16
17         mpfi  3.62    3.39               8.0        182      5400
15

   highway-mpg  price
10          29  16430
11          29  16925
12          28  20970
13          28  21105
14          25  24565
15          22  30760
16          22  41315
17          20  36880

[8 rows x 26 columns]
```

Here we have some empty values and we will handle it by going for the median mean or mode . but some column we may have to drop if we dont have the price column because it is our target column or our dependent variable we don't want it to be filled with inaccurate data

```
# finding mean()
bmw_mean_norml_lss = auto.loc[(auto['make']=='bmw') &
(auto['normalized-losses']!=0),'normalized-losses'].mean()

# assigning mean() to last three bmw cars because we have found it
have zero values
```

```
auto.loc[(auto['make']=='bmw') & (auto['normalized-losses']==0) &
(auto['price']>30000),'normalized-losses'] = int(bmw_mean_norml_lss)

bmw_mean_norml_lss2 = auto.loc[(auto['make']=='bmw') &
(auto['normalized-losses']!=0),'normalized-losses'].mean()

bmw_mean_norml_lss2
```

```
190.0
```

```
auto.loc[(auto['make']=='bmw') & (auto['normalized-
losses']==0) ,'normalized-losses'] = int(bmw_mean_norml_lss2)

auto[auto['make']=='bmw']
```

```
    symboling  normalized-losses make fuel-type aspiration num-of-
doors  \
10          2                192  bmw       gas        std
two
11          0                192  bmw       gas        std
four
12          0                188  bmw       gas        std
two
13          0                188  bmw       gas        std
four
14          1                190  bmw       gas        std
four
15          0                190  bmw       gas        std
four
16          0                190  bmw       gas        std
two
17          0                190  bmw       gas        std
four

   body-style drive-wheels engine-location  wheel-base  ...  engine-
size  \
10      sedan          rwd           front       101.2  ...
108
11      sedan          rwd           front       101.2  ...
108
12      sedan          rwd           front       101.2  ...
164
13      sedan          rwd           front       101.2  ...
164
14      sedan          rwd           front       103.5  ...
164
15      sedan          rwd           front       103.5  ...
209
16      sedan          rwd           front       103.5  ...
209
17      sedan          rwd           front       110.0  ...
```

```
209

    fuel-system  bore  stroke compression-ratio horsepower  peak-rpm
city-mpg  \
10         mpfi  3.50    2.80               8.8        101      5800
23
11         mpfi  3.50    2.80               8.8        101      5800
23
12         mpfi  3.31    3.19               9.0        121      4250
21
13         mpfi  3.31    3.19               9.0        121      4250
21
14         mpfi  3.31    3.19               9.0        121      4250
20
15         mpfi  3.62    3.39               8.0        182      5400
16
16         mpfi  3.62    3.39               8.0        182      5400
16
17         mpfi  3.62    3.39               8.0        182      5400
15

   highway-mpg  price
10          29  16430
11          29  16925
12          28  20970
13          28  21105
14          25  24565
15          22  30760
16          22  41315
17          20  36880

[8 rows x 26 columns]
```

```
auto['price'].dtype
```

```
dtype('int32')
```

Chevrolet

```
auto[auto['make']=='chevrolet']
```

```
    symboling  normalized-losses       make fuel-type aspiration num-
of-doors  \
18          2                121  chevrolet       gas        std
two
19          1                 98  chevrolet       gas        std
two
20          0                 81  chevrolet       gas        std
```

```
four

   body-style drive-wheels engine-location  wheel-base  ...  engine-
size  \
18  hatchback          fwd           front        88.4  ...
61
19  hatchback          fwd           front        94.5  ...
90
20      sedan          fwd           front        94.5  ...
90

    fuel-system  bore  stroke compression-ratio horsepower  peak-rpm
city-mpg  \
18         2bbl  2.91    3.03               9.5         48      5100
47
19         2bbl  3.03    3.11               9.6         70      5400
38
20         2bbl  3.03    3.11               9.6         70      5400
38

   highway-mpg price
18          53  5151
19          43  6295
20          43  6575

[3 rows x 26 columns]
```

Chevorlet is Fine and does not require any changes

Dodge

```
auto[auto['make']=='dodge']

    symboling  normalized-losses   make fuel-type aspiration num-of-
doors  \
21          1                118  dodge       gas        std
two
22          1                118  dodge       gas        std
two
23          1                118  dodge       gas      turbo
two
24          1                148  dodge       gas        std
four
25          1                148  dodge       gas        std
four
26          1                148  dodge       gas        std
four
27          1                148  dodge       gas      turbo
```

```
NaN
28         -1                110  dodge       gas        std
four
29          3                145  dodge       gas      turbo
two

   body-style drive-wheels engine-location  wheel-base  ...  engine-
size  \
21  hatchback          fwd           front        93.7  ...
90
22  hatchback          fwd           front        93.7  ...
90
23  hatchback          fwd           front        93.7  ...
98
24  hatchback          fwd           front        93.7  ...
90
25      sedan          fwd           front        93.7  ...
90
26      sedan          fwd           front        93.7  ...
90
27      sedan          fwd           front        93.7  ...
98
28      wagon          fwd           front       103.3  ...
122
29  hatchback          fwd           front        95.9  ...
156

    fuel-system  bore  stroke compression-ratio horsepower  peak-rpm
city-mpg  \
21         2bbl  2.97    3.23              9.41         68      5500
37
22         2bbl  2.97    3.23              9.40         68      5500
31
23         mpfi  3.03    3.39              7.60        102      5500
24
24         2bbl  2.97    3.23              9.40         68      5500
31
25         2bbl  2.97    3.23              9.40         68      5500
31
26         2bbl  2.97    3.23              9.40         68      5500
31
27         mpfi  3.03    3.39              7.60        102      5500
24
28         2bbl  3.34    3.46              8.50         88      5000
24
29          mfi  3.60    3.90              7.00        145      5000
19

   highway-mpg  price
21          41   5572
```

```
22           38   6377
23           30   7957
24           38   6229
25           38   6692
26           38   7609
27           30   8558
28           30   8921
29           24  12964

[9 rows x 26 columns]
```

Dodge is Fine and does not require any changes

Honda

```
auto[auto['make']=='honda']
```

```
    symboling  normalized-losses   make fuel-type aspiration num-of-
doors  \
30          2                137  honda       gas        std
two
31          2                137  honda       gas        std
two
32          1                101  honda       gas        std
two
33          1                101  honda       gas        std
two
34          1                101  honda       gas        std
two
35          0                110  honda       gas        std
four
36          0                 78  honda       gas        std
four
37          0                106  honda       gas        std
two
38          0                106  honda       gas        std
two
39          0                 85  honda       gas        std
four
40          0                 85  honda       gas        std
four
41          0                 85  honda       gas        std
four
42          1                107  honda       gas        std
two

   body-style drive-wheels engine-location  wheel-base  ...  engine-
size  \
```

```
30  hatchback           fwd           front        86.6  ...
92
31  hatchback           fwd           front        86.6  ...
92
32  hatchback           fwd           front        93.7  ...
79
33  hatchback           fwd           front        93.7  ...
92
34  hatchback           fwd           front        93.7  ...
92
35      sedan           fwd           front        96.5  ...
92
36      wagon           fwd           front        96.5  ...
92
37  hatchback           fwd           front        96.5  ...
110
38  hatchback           fwd           front        96.5  ...
110
39      sedan           fwd           front        96.5  ...
110
40      sedan           fwd           front        96.5  ...
110
41      sedan           fwd           front        96.5  ...
110
42      sedan           fwd           front        96.5  ...
110

    fuel-system  bore  stroke compression-ratio horsepower  peak-rpm
city-mpg  \
30         1bbl  2.91    3.41               9.6         58      4800
49
31         1bbl  2.91    3.41               9.2         76      6000
31
32         1bbl  2.91    3.07              10.1         60      5500
38
33         1bbl  2.91    3.41               9.2         76      6000
30
34         1bbl  2.91    3.41               9.2         76      6000
30
35         1bbl  2.91    3.41               9.2         76      6000
30
36         1bbl  2.92    3.41               9.2         76      6000
30
37         1bbl  3.15    3.58               9.0         86      5800
27
38         1bbl  3.15    3.58               9.0         86      5800
27
39         1bbl  3.15    3.58               9.0         86      5800
27
```

```
40          1bbl  3.15    3.58                9.0          86      5800
27
41          mpfi  3.15    3.58                9.0         101      5800
24
42          2bbl  3.15    3.58                9.1         100      5500
25

   highway-mpg  price
30          54   6479
31          38   6855
32          42   5399
33          34   6529
34          34   7129
35          34   7295
36          34   7295
37          33   7895
38          33   9095
39          33   8845
40          33  10295
41          28  12945
42          31  10345

[13 rows x 26 columns]
```

Honda is Fine and does not require any changes

Isuzu

```
auto[auto['make']=='isuzu']
```

```
    symboling  normalized-losses   make fuel-type aspiration num-of-
doors  \
43          0                  0  isuzu       gas        std
four
46          2                  0  isuzu       gas        std
two

   body-style drive-wheels engine-location  wheel-base  ...  engine-
size  \
43      sedan          rwd           front        94.3  ...
111
46  hatchback          rwd           front        96.0  ...
119

    fuel-system  bore  stroke compression-ratio horsepower  peak-rpm
city-mpg  \
43         2bbl  3.31    3.23               8.5         78      4800
24
```

```
46         spfi  3.43    3.23               9.2         90      5000
24

   highway-mpg  price
43          29   6785
46          29  11048

[2 rows x 26 columns]
```

Since the normalized-losses column here is actually having the value zero , we can't evaluate anything so we actually skip this step for now and move with it later after filling all the valid null values and then we will find the mean or mode or median and fill the missing values with that data.

```
auto.drop(auto[auto['price']==0].index ,axis=0,inplace=True)

auto[auto['make']=='isuzu']

    symboling  normalized-losses   make fuel-type aspiration num-of-
doors  \
43          0                  0  isuzu       gas        std
four
46          2                  0  isuzu       gas        std
two

   body-style drive-wheels engine-location  wheel-base  ...  engine-
size  \
43      sedan          rwd           front        94.3  ...
111
46  hatchback          rwd           front        96.0  ...
119

    fuel-system  bore  stroke compression-ratio horsepower  peak-rpm
city-mpg  \
43         2bbl  3.31    3.23               8.5         78      4800
24
46         spfi  3.43    3.23               9.2         90      5000
24

   highway-mpg  price
43          29   6785
46          29  11048

[2 rows x 26 columns]
```

Jaguar

```
auto[auto['make']=='jaguar']
```

```
    symboling  normalized-losses    make fuel-type aspiration num-of-
doors  \
47          0                145  jaguar       gas        std
four
48          0                  0  jaguar       gas        std
four
49          0                  0  jaguar       gas        std
two

   body-style drive-wheels engine-location  wheel-base  ...  engine-
size  \
47      sedan          rwd           front       113.0  ...
258
48      sedan          rwd           front       113.0  ...
258
49      sedan          rwd           front       102.0  ...
326

    fuel-system  bore  stroke compression-ratio horsepower  peak-rpm
city-mpg  \
47         mpfi  3.63    4.17               8.1        176      4750
15
48         mpfi  3.63    4.17               8.1        176      4750
15
49         mpfi  3.54    2.76              11.5        262      5000
13

   highway-mpg  price
47          19  32250
48          19  35550
49          17  36000

[3 rows x 26 columns]
```

Here Jaguar make has 2 empty values in the normalized-losses column

```
auto.loc[(auto['make'] == 'jaguar') & (auto['price'] > 35000),
'normalized-losses'] = 145

auto[auto['make']=='jaguar']
```

```
    symboling  normalized-losses    make fuel-type aspiration num-of-
doors  \
47          0                145  jaguar       gas        std
four
48          0                145  jaguar       gas        std
four
49          0                145  jaguar       gas        std
two
```

```
   body-style drive-wheels engine-location  wheel-base  ...  engine-
size  \
47      sedan          rwd           front       113.0  ...
258
48      sedan          rwd           front       113.0  ...
258
49      sedan          rwd           front       102.0  ...
326

    fuel-system  bore  stroke compression-ratio horsepower  peak-rpm
city-mpg  \
47         mpfi  3.63    4.17               8.1        176      4750
15
48         mpfi  3.63    4.17               8.1        176      4750
15
49         mpfi  3.54    2.76              11.5        262      5000
13

   highway-mpg  price
47          19  32250
48          19  35550
49          17  36000

[3 rows x 26 columns]
```

We have successfully completed filling the missing values for the make Jaguar

Mazda

```
auto[auto['make']=='mazda']
```

```
    symboling  normalized-losses   make fuel-type aspiration num-of-
doors  \
50          1                104  mazda       gas        std
two
51          1                104  mazda       gas        std
two
52          1                104  mazda       gas        std
two
53          1                113  mazda       gas        std
four
54          1                113  mazda       gas        std
four
55          3                150  mazda       gas        std
two
56          3                150  mazda       gas        std
two
```

```
57          3                150  mazda       gas         std
two
58          3                150  mazda       gas         std
two
59          1                129  mazda       gas         std
two
60          0                115  mazda       gas         std
four
61          1                129  mazda       gas         std
two
62          0                115  mazda       gas         std
four
63          0                  0  mazda    diesel         std
NaN
64          0                115  mazda       gas         std
four
65          0                118  mazda       gas         std
four
66          0                  0  mazda    diesel         std
four

   body-style drive-wheels engine-location  wheel-base  ...  engine-
size  \
50  hatchback          fwd           front        93.1  ...
91
51  hatchback          fwd           front        93.1  ...
91
52  hatchback          fwd           front        93.1  ...
91
53      sedan          fwd           front        93.1  ...
91
54      sedan          fwd           front        93.1  ...
91
55  hatchback          rwd           front        95.3  ...
70
56  hatchback          rwd           front        95.3  ...
70
57  hatchback          rwd           front        95.3  ...
70
58  hatchback          rwd           front        95.3  ...
80
59  hatchback          fwd           front        98.8  ...
122
60      sedan          fwd           front        98.8  ...
122
61  hatchback          fwd           front        98.8  ...
122
62      sedan          fwd           front        98.8  ...
122
```

```
63      sedan           fwd            front        98.8  ...
122
64  hatchback           fwd            front        98.8  ...
122
65      sedan           rwd            front       104.9  ...
140
66      sedan           rwd            front       104.9  ...
134

    fuel-system  bore  stroke compression-ratio horsepower  peak-rpm
city-mpg  \
50         2bbl  3.03    3.15               9.0         68      5000
30
51         2bbl  3.03    3.15               9.0         68      5000
31
52         2bbl  3.03    3.15               9.0         68      5000
31
53         2bbl  3.03    3.15               9.0         68      5000
31
54         2bbl  3.08    3.15               9.0         68      5000
31
55         4bbl   NaN     NaN               9.4        101      6000
17
56         4bbl   NaN     NaN               9.4        101      6000
17
57         4bbl   NaN     NaN               9.4        101      6000
17
58         mpfi   NaN     NaN               9.4        135      6000
16
59         2bbl  3.39    3.39               8.6         84      4800
26
60         2bbl  3.39    3.39               8.6         84      4800
26
61         2bbl  3.39    3.39               8.6         84      4800
26
62         2bbl  3.39    3.39               8.6         84      4800
26
63          idi  3.39    3.39              22.7         64      4650
36
64         2bbl  3.39    3.39               8.6         84      4800
26
65         mpfi  3.76    3.16               8.0        120      5000
19
66          idi  3.43    3.64              22.0         72      4200
31

   highway-mpg  price
50          31   5195
51          38   6095
```

```
52           38   6795
53           38   6695
54           38   7395
55           23  10945
56           23  11845
57           23  13645
58           23  15645
59           32   8845
60           32   8495
61           32  10595
62           32  10245
63           42  10795
64           32  11245
65           27  18280
66           39  18344

[17 rows x 26 columns]
```

We can find that there are some empty values and we will eventually fix it now with mean or median we will now check what to do with this data

```
auto[auto['make']=='mazda']['normalized-losses'].median()
```

```
115.0
```

```
med_val_for_mazda = int(auto[auto['make']=='mazda']['normalized-
losses'].median())
med_val_for_mazda
```

```
115
```

```
mean_for_mazda = int(auto[auto['make']=='mazda']['normalized-
losses'].mean())
mean_for_mazda
```

```
109
```

```
# for median value = 66

# fuel-type = diesel , wheel-base = 104.9
auto.loc[ (auto['make']=='mazda') & (auto['fuel-type']=='diesel') &
(auto['wheel-base']==104.9), 'normalized-losses' ] = med_val_for_mazda


# for mean value = 63
auto.loc[ (auto['make']=='mazda') & (auto['fuel-type']=='diesel') &
(auto['wheel-base']==98.8), 'normalized-losses' ] = mean_for_mazda

auto[(auto['normalized-losses']==0) & (auto['make']=='mazda')] =
mean_for_mazda
```

```
auto[auto['make']=='mazda']
```

```
    symboling  normalized-losses   make fuel-type aspiration num-of-
doors  \
50          1                104  mazda       gas        std
two
51          1                104  mazda       gas        std
two
52          1                104  mazda       gas        std
two
53          1                113  mazda       gas        std
four
54          1                113  mazda       gas        std
four
55          3                150  mazda       gas        std
two
56          3                150  mazda       gas        std
two
57          3                150  mazda       gas        std
two
58          3                150  mazda       gas        std
two
59          1                129  mazda       gas        std
two
60          0                115  mazda       gas        std
four
61          1                129  mazda       gas        std
two
62          0                115  mazda       gas        std
four
63          0                109  mazda    diesel        std
NaN
64          0                115  mazda       gas        std
four
65          0                118  mazda       gas        std
four

   body-style drive-wheels engine-location  wheel-base  ...  engine-
size  \
50  hatchback          fwd           front        93.1  ...
91
51  hatchback          fwd           front        93.1  ...
91
52  hatchback          fwd           front        93.1  ...
91
53      sedan          fwd           front        93.1  ...
91
54      sedan          fwd           front        93.1  ...
91
55  hatchback          rwd           front        95.3  ...
```

```
70
56  hatchback          rwd           front        95.3  ...
70
57  hatchback          rwd           front        95.3  ...
70
58  hatchback          rwd           front        95.3  ...
80
59  hatchback          fwd           front        98.8  ...
122
60      sedan          fwd           front        98.8  ...
122
61  hatchback          fwd           front        98.8  ...
122
62      sedan          fwd           front        98.8  ...
122
63      sedan          fwd           front        98.8  ...
122
64  hatchback          fwd           front        98.8  ...
122
65      sedan          rwd           front       104.9  ...
140

    fuel-system  bore  stroke compression-ratio horsepower  peak-rpm
city-mpg  \
50         2bbl  3.03    3.15               9.0         68      5000
30
51         2bbl  3.03    3.15               9.0         68      5000
31
52         2bbl  3.03    3.15               9.0         68      5000
31
53         2bbl  3.03    3.15               9.0         68      5000
31
54         2bbl  3.08    3.15               9.0         68      5000
31
55         4bbl   NaN     NaN               9.4        101      6000
17
56         4bbl   NaN     NaN               9.4        101      6000
17
57         4bbl   NaN     NaN               9.4        101      6000
17
58         mpfi   NaN     NaN               9.4        135      6000
16
59         2bbl  3.39    3.39               8.6         84      4800
26
60         2bbl  3.39    3.39               8.6         84      4800
26
61         2bbl  3.39    3.39               8.6         84      4800
26
62         2bbl  3.39    3.39               8.6         84      4800
26
```

```
63           idi  3.39    3.39               22.7          64       4650
36
64         2bbl  3.39    3.39                8.6          84       4800
26
65         mpfi  3.76    3.16                8.0         120       5000
19

   highway-mpg  price
50          31   5195
51          38   6095
52          38   6795
53          38   6695
54          38   7395
55          23  10945
56          23  11845
57          23  13645
58          23  15645
59          32   8845
60          32   8495
61          32  10595
62          32  10245
63          42  10795
64          32  11245
65          27  18280

[16 rows x 26 columns]
```

We have successfully completed the Mazda cars missing values

Mercedes-Benz

```
auto[auto['make']=='mercedes-benz']
```

```
    symboling  normalized-losses           make fuel-type
aspiration  \
67         -1                 93  mercedes-benz    diesel      turbo

68         -1                 93  mercedes-benz    diesel      turbo

69          0                 93  mercedes-benz    diesel      turbo

70         -1                 93  mercedes-benz    diesel      turbo

71         -1                  0  mercedes-benz       gas        std

72          3                142  mercedes-benz       gas        std

73          0                  0  mercedes-benz       gas        std
```

```
74          1                  0  mercedes-benz       gas        std


   num-of-doors   body-style drive-wheels engine-location  wheel-base
...  \
67          four        sedan          rwd           front       110.0
...
68          four        wagon          rwd           front       110.0
...
69           two      hardtop          rwd           front       106.7
...
70          four        sedan          rwd           front       115.6
...
71          four        sedan          rwd           front       115.6
...
72           two  convertible          rwd           front        96.6
...
73          four        sedan          rwd           front       120.9
...
74           two      hardtop          rwd           front       112.0
...

    engine-size  fuel-system  bore  stroke compression-ratio
horsepower  \
67          183          idi  3.58    3.64              21.5
123
68          183          idi  3.58    3.64              21.5
123
69          183          idi  3.58    3.64              21.5
123
70          183          idi  3.58    3.64              21.5
123
71          234         mpfi  3.46    3.10               8.3
155
72          234         mpfi  3.46    3.10               8.3
155
73          308         mpfi  3.80    3.35               8.0
184
74          304         mpfi  3.80    3.35               8.0
184

    peak-rpm city-mpg highway-mpg  price
67      4350       22          25  25552
68      4350       22          25  28248
69      4350       22          25  28176
70      4350       22          25  31600
71      4750       16          18  34184
72      4750       16          18  35056
73      4500       14          16  40960
74      4500       14          16  45400
```

```
[8 rows x 26 columns]
```

As you can see that there are some empty values in the normalized-losses column we will now fill in those with either mean median or mode

```
# mean of normalized losses for mercedez- benz

auto[auto['make']=='mercedes-benz']['normalized-losses'].mean()
```

```
64.25
```

```
# median of normalized losses for mercedez- benz

median_of_merce = auto[auto['make']=='mercedes-benz']['normalized-
losses'].median()
median_of_merce
```

```
93.0
```

```
auto.loc[(auto['make']=='mercedes-benz') & (auto['normalized-
losses']==0) , 'normalized-losses'] = int(median_of_merce)

auto.loc[(auto['make']=='mercedes-benz') & (auto['normalized-
losses']==93) & (auto['aspiration']=='std') , 'normalized-losses'] =
142

auto[auto['make']=='mercedes-benz']
```

```
    symboling  normalized-losses           make fuel-type
aspiration  \
67         -1                 93  mercedes-benz    diesel      turbo

68         -1                 93  mercedes-benz    diesel      turbo

69          0                 93  mercedes-benz    diesel      turbo

70         -1                 93  mercedes-benz    diesel      turbo

71         -1                142  mercedes-benz       gas        std

72          3                142  mercedes-benz       gas        std

73          0                142  mercedes-benz       gas        std

74          1                142  mercedes-benz       gas        std


   num-of-doors   body-style drive-wheels engine-location  wheel-base
...  \
67         four        sedan          rwd           front       110.0
...
```

```
68          four        wagon           rwd           front       110.0
...
69           two      hardtop           rwd           front       106.7
...
70          four        sedan           rwd           front       115.6
...
71          four        sedan           rwd           front       115.6
...
72           two  convertible           rwd           front        96.6
...
73          four        sedan           rwd           front       120.9
...
74           two      hardtop           rwd           front       112.0
...

    engine-size  fuel-system  bore  stroke compression-ratio
horsepower  \
67          183          idi  3.58    3.64              21.5
123
68          183          idi  3.58    3.64              21.5
123
69          183          idi  3.58    3.64              21.5
123
70          183          idi  3.58    3.64              21.5
123
71          234         mpfi  3.46    3.10               8.3
155
72          234         mpfi  3.46    3.10               8.3
155
73          308         mpfi  3.80    3.35               8.0
184
74          304         mpfi  3.80    3.35               8.0
184

    peak-rpm city-mpg highway-mpg  price
67      4350       22          25  25552
68      4350       22          25  28248
69      4350       22          25  28176
70      4350       22          25  31600
71      4750       16          18  34184
72      4750       16          18  35056
73      4500       14          16  40960
74      4500       14          16  45400

[8 rows x 26 columns]
```

Now the make Mercedez-Benz has finished filling the missing values lets move onto the next make

Mercury

```
auto[auto['make']=='mercury']
```

```
    symboling  normalized-losses     make fuel-type aspiration num-of-
doors  \
75          1                  0  mercury       gas      turbo
two

   body-style drive-wheels engine-location  wheel-base  ...  engine-
size  \
75  hatchback          rwd           front       102.7  ...
140

    fuel-system  bore  stroke compression-ratio horsepower  peak-rpm
city-mpg  \
75         mpfi  3.78    3.12               8.0        175      5000
19

   highway-mpg  price
75          24  16503

[1 rows x 26 columns]
```

THis issue where only a single row is present for only a single make so there will be a wait , and we will later fill it with the corresponding mean after everything

Mitsubishi

```
auto[auto['make']=='mitsubishi']
```

```
    symboling  normalized-losses        make fuel-type aspiration  \
76          2                161  mitsubishi       gas        std
77          2                161  mitsubishi       gas        std
78          2                161  mitsubishi       gas        std
79          1                161  mitsubishi       gas      turbo
80          3                153  mitsubishi       gas      turbo
81          3                153  mitsubishi       gas        std
82          3                  0  mitsubishi       gas      turbo
83          3                  0  mitsubishi       gas      turbo
84          3                  0  mitsubishi       gas      turbo
85          1                125  mitsubishi       gas        std
86          1                125  mitsubishi       gas        std
87          1                125  mitsubishi       gas      turbo
88         -1                137  mitsubishi       gas        std

   num-of-doors body-style drive-wheels engine-location  wheel-
base  ...  \
76          two  hatchback          fwd           front
```

```
93.7  ...
77          two  hatchback          fwd            front
93.7  ...
78          two  hatchback          fwd            front
93.7  ...
79          two  hatchback          fwd            front
93.0  ...
80          two  hatchback          fwd            front
96.3  ...
81          two  hatchback          fwd            front
96.3  ...
82          two  hatchback          fwd            front
95.9  ...
83          two  hatchback          fwd            front
95.9  ...
84          two  hatchback          fwd            front
95.9  ...
85         four      sedan          fwd            front
96.3  ...
86         four      sedan          fwd            front
96.3  ...
87         four      sedan          fwd            front
96.3  ...
88         four      sedan          fwd            front
96.3  ...

    engine-size  fuel-system  bore  stroke compression-ratio
horsepower  \
76           92         2bbl  2.97    3.23               9.4
68
77           92         2bbl  2.97    3.23               9.4
68
78           92         2bbl  2.97    3.23               9.4
68
79           98         spdi  3.03    3.39               7.6
102
80          110         spdi  3.17    3.46               7.5
116
81          122         2bbl  3.35    3.46               8.5
88
82          156         spdi  3.58    3.86               7.0
145
83          156         spdi  3.59    3.86               7.0
145
84          156         spdi  3.59    3.86               7.0
145
85          122         2bbl  3.35    3.46               8.5
88
86          122         2bbl  3.35    3.46               8.5
```

```
88
87          110          spdi  3.17    3.46                7.5
116
88          110          spdi  3.17    3.46                7.5
116

    peak-rpm city-mpg highway-mpg  price
76      5500       37          41   5389
77      5500       31          38   6189
78      5500       31          38   6669
79      5500       24          30   7689
80      5500       23          30   9959
81      5000       25          32   8499
82      5000       19          24  12629
83      5000       19          24  14869
84      5000       19          24  14489
85      5000       25          32   6989
86      5000       25          32   8189
87      5500       23          30   9279
88      5500       23          30   9279

[13 rows x 26 columns]
```

THere are empty zero values in normalized values

```
# mean of mitsubushi normalized losses


median_mitsubishi_nrml_ls = auto[(auto['make']=='mitsubishi')]
['normalized-losses'].median()
median_mitsubishi_nrml_ls

137.0

# fillin in the zeros with median

auto.loc[(auto['make']=='mitsubishi') & (auto['normalized-
losses']==0),'normalized-losses'] = median_mitsubishi_nrml_ls

auto[auto['make']=='mitsubishi']

    symboling  normalized-losses        make fuel-type aspiration  \
76          2                161  mitsubishi       gas        std
77          2                161  mitsubishi       gas        std
78          2                161  mitsubishi       gas        std
79          1                161  mitsubishi       gas      turbo
80          3                153  mitsubishi       gas      turbo
81          3                153  mitsubishi       gas        std
82          3                137  mitsubishi       gas      turbo
83          3                137  mitsubishi       gas      turbo
```

```
84          3                137  mitsubishi       gas      turbo
85          1                125  mitsubishi       gas        std
86          1                125  mitsubishi       gas        std
87          1                125  mitsubishi       gas      turbo
88         -1                137  mitsubishi       gas        std

   num-of-doors body-style drive-wheels engine-location  wheel-
base  ...  \
76          two  hatchback          fwd            front
93.7  ...
77          two  hatchback          fwd            front
93.7  ...
78          two  hatchback          fwd            front
93.7  ...
79          two  hatchback          fwd            front
93.0  ...
80          two  hatchback          fwd            front
96.3  ...
81          two  hatchback          fwd            front
96.3  ...
82          two  hatchback          fwd            front
95.9  ...
83          two  hatchback          fwd            front
95.9  ...
84          two  hatchback          fwd            front
95.9  ...
85         four      sedan          fwd            front
96.3  ...
86         four      sedan          fwd            front
96.3  ...
87         four      sedan          fwd            front
96.3  ...
88         four      sedan          fwd            front
96.3  ...

    engine-size  fuel-system  bore  stroke compression-ratio
horsepower  \
76           92         2bbl  2.97    3.23               9.4
68
77           92         2bbl  2.97    3.23               9.4
68
78           92         2bbl  2.97    3.23               9.4
68
79           98         spdi  3.03    3.39               7.6
102
80          110         spdi  3.17    3.46               7.5
116
81          122         2bbl  3.35    3.46               8.5
88
```

```
82           156          spdi  3.58    3.86                 7.0
145
83           156          spdi  3.59    3.86                 7.0
145
84           156          spdi  3.59    3.86                 7.0
145
85           122          2bbl  3.35    3.46                 8.5
88
86           122          2bbl  3.35    3.46                 8.5
88
87           110          spdi  3.17    3.46                 7.5
116
88           110          spdi  3.17    3.46                 7.5
116

    peak-rpm city-mpg highway-mpg  price
76      5500       37          41   5389
77      5500       31          38   6189
78      5500       31          38   6669
79      5500       24          30   7689
80      5500       23          30   9959
81      5000       25          32   8499
82      5000       19          24  12629
83      5000       19          24  14869
84      5000       19          24  14489
85      5000       25          32   6989
86      5000       25          32   8189
87      5500       23          30   9279
88      5500       23          30   9279

[13 rows x 26 columns]
```

Nissan

```
auto[auto['make']=='nissan']

     symboling  normalized-losses    make fuel-type aspiration num-of-
doors  \
89           1                128  nissan       gas        std
two
90           1                128  nissan    diesel        std
two
91           1                128  nissan       gas        std
two
92           1                122  nissan       gas        std
four
93           1                103  nissan       gas        std
four
```

```
94           1                128  nissan       gas        std
two
95           1                128  nissan       gas        std
two
96           1                122  nissan       gas        std
four
97           1                103  nissan       gas        std
four
98           2                168  nissan       gas        std
two
99           0                106  nissan       gas        std
four
100          0                106  nissan       gas        std
four
101          0                128  nissan       gas        std
four
102          0                108  nissan       gas        std
four
103          0                108  nissan       gas        std
four
104          3                194  nissan       gas        std
two
105          3                194  nissan       gas      turbo
two
106          1                231  nissan       gas        std
two

    body-style drive-wheels engine-location  wheel-base  ...  engine-
size  \
89       sedan          fwd           front        94.5  ...
97
90       sedan          fwd           front        94.5  ...
103
91       sedan          fwd           front        94.5  ...
97
92       sedan          fwd           front        94.5  ...
97
93       wagon          fwd           front        94.5  ...
97
94       sedan          fwd           front        94.5  ...
97
95   hatchback          fwd           front        94.5  ...
97
96       sedan          fwd           front        94.5  ...
97
97       wagon          fwd           front        94.5  ...
97
98     hardtop          fwd           front        95.1  ...
97
```

```
99   hatchback          fwd           front        97.2  ...
120
100      sedan          fwd           front        97.2  ...
120
101      sedan          fwd           front       100.4  ...
181
102      wagon          fwd           front       100.4  ...
181
103      sedan          fwd           front       100.4  ...
181
104  hatchback          rwd           front        91.3  ...
181
105  hatchback          rwd           front        91.3  ...
181
106  hatchback          rwd           front        99.2  ...
181

     fuel-system  bore  stroke compression-ratio horsepower  peak-rpm
\
89          2bbl  3.15    3.29               9.4         69      5200

90           idi  2.99    3.47              21.9         55      4800

91          2bbl  3.15    3.29               9.4         69      5200

92          2bbl  3.15    3.29               9.4         69      5200

93          2bbl  3.15    3.29               9.4         69      5200

94          2bbl  3.15    3.29               9.4         69      5200

95          2bbl  3.15    3.29               9.4         69      5200

96          2bbl  3.15    3.29               9.4         69      5200

97          2bbl  3.15    3.29               9.4         69      5200

98          2bbl  3.15    3.29               9.4         69      5200

99          2bbl  3.33    3.47               8.5         97      5200

100         2bbl  3.33    3.47               8.5         97      5200

101         mpfi  3.43    3.27               9.0        152      5200

102         mpfi  3.43    3.27               9.0        152      5200

103         mpfi  3.43    3.27               9.0        152      5200

104         mpfi  3.43    3.27               9.0        160      5200
```

```
105          mpfi  3.43    3.27                7.8         200       5200

106          mpfi  3.43    3.27                9.0         160       5200


     city-mpg highway-mpg  price
89         31           37   5499
90         45           50   7099
91         31           37   6649
92         31           37   6849
93         31           37   7349
94         31           37   7299
95         31           37   7799
96         31           37   7499
97         31           37   7999
98         31           37   8249
99         27           34   8949
100        27           34   9549
101        17           22  13499
102        17           22  14399
103        19           25  13499
104        19           25  17199
105        17           23  19699
106        19           25  18399

[18 rows x 26 columns]
```

Nissan is fine

Peugot

```
# mean of puegot nrml los

auto[auto['make']=='peugot']['normalized-losses'].mean()
```

```
102.45454545454545
```

```
# median of puegot nrml los

med = auto[auto['make']=='peugot']['normalized-losses'].median()
med
```

```
161.0
```

```
auto.loc[ (auto['make']=='peugot') & (auto['normalized-
losses']==0) ,'normalized-losses'] = int(med)

auto[auto['make']=='peugot']
```

```
     symboling  normalized-losses    make fuel-type aspiration num-of-
doors  \
107          0                161  peugot       gas        std
four
108          0                161  peugot    diesel      turbo
four
109          0                161  peugot       gas        std
four
110          0                161  peugot    diesel      turbo
four
111          0                161  peugot       gas        std
four
112          0                161  peugot    diesel      turbo
four
113          0                161  peugot       gas        std
four
114          0                161  peugot    diesel      turbo
four
115          0                161  peugot       gas        std
four
116          0                161  peugot    diesel      turbo
four
117          0                161  peugot       gas      turbo
four

    body-style drive-wheels engine-location  wheel-base  ...  engine-
size  \
107      sedan          rwd           front       107.9  ...
120
108      sedan          rwd           front       107.9  ...
152
109      wagon          rwd           front       114.2  ...
120
110      wagon          rwd           front       114.2  ...
152
111      sedan          rwd           front       107.9  ...
120
112      sedan          rwd           front       107.9  ...
152
113      wagon          rwd           front       114.2  ...
120
114      wagon          rwd           front       114.2  ...
152
115      sedan          rwd           front       107.9  ...
120
116      sedan          rwd           front       107.9  ...
152
117      sedan          rwd           front       108.0  ...
134
```

```
     fuel-system  bore  stroke compression-ratio horsepower  peak-rpm
\
107         mpfi  3.46    3.19               8.4         97      5000

108          idi  3.70    3.52              21.0         95      4150

109         mpfi  3.46    3.19               8.4         97      5000

110          idi  3.70    3.52              21.0         95      4150

111         mpfi  3.46    2.19               8.4         95      5000

112          idi  3.70    3.52              21.0         95      4150

113         mpfi  3.46    2.19               8.4         95      5000

114          idi  3.70    3.52              21.0         95      4150

115         mpfi  3.46    3.19               8.4         97      5000

116          idi  3.70    3.52              21.0         95      4150

117         mpfi  3.61    3.21               7.0        142      5600


    city-mpg highway-mpg  price
107       19          24  11900
108       28          33  13200
109       19          24  12440
110       25          25  13860
111       19          24  15580
112       28          33  16900
113       19          24  16695
114       25          25  17075
115       19          24  16630
116       28          33  17950
117       18          24  18150

[11 rows x 26 columns]
```

Now the make puegot is actually finished

plymouth

```
auto[auto['make']=='plymouth']
```

```
     symboling  normalized-losses      make fuel-type aspiration num-
of-doors  \
118          1                119  plymouth       gas        std
two
```

```
119          1                119  plymouth       gas      turbo
two
120          1                154  plymouth       gas        std
four
121          1                154  plymouth       gas        std
four
122          1                154  plymouth       gas        std
four
123         -1                 74  plymouth       gas        std
four
124          3                  0  plymouth       gas      turbo
two

    body-style drive-wheels engine-location  wheel-base  ...  engine-
size  \
118  hatchback          fwd           front        93.7  ...
90
119  hatchback          fwd           front        93.7  ...
98
120  hatchback          fwd           front        93.7  ...
90
121      sedan          fwd           front        93.7  ...
90
122      sedan          fwd           front        93.7  ...
98
123      wagon          fwd           front       103.3  ...
122
124  hatchback          rwd           front        95.9  ...
156

     fuel-system  bore  stroke compression-ratio horsepower  peak-rpm
\
118         2bbl  2.97    3.23                9.4         68      5500

119         spdi  3.03    3.39                7.6        102      5500

120         2bbl  2.97    3.23                9.4         68      5500

121         2bbl  2.97    3.23                9.4         68      5500

122         2bbl  2.97    3.23                9.4         68      5500

123         2bbl  3.35    3.46                8.5         88      5000

124         spdi  3.59    3.86                7.0        145      5000


    city-mpg highway-mpg  price
118       37          41   5572
119       24          30   7957
```

```
120       31           38   6229
121       31           38   6692
122       31           38   7609
123       24           30   8921
124       19           24  12764

[7 rows x 26 columns]
```

Just a single mean might be enough

```
median_value = auto[auto['make']=='plymouth']['normalized-
losses'].median()

auto.loc[(auto['make']=='plymouth') &  (auto['normalized-losses']==0)
,'normalized-losses'] = median_value

auto[auto['make']=='plymouth']
```

```
     symboling  normalized-losses      make fuel-type aspiration num-
of-doors  \
118          1                119  plymouth       gas        std
two
119          1                119  plymouth       gas      turbo
two
120          1                154  plymouth       gas        std
four
121          1                154  plymouth       gas        std
four
122          1                154  plymouth       gas        std
four
123         -1                 74  plymouth       gas        std
four
124          3                119  plymouth       gas      turbo
two

    body-style drive-wheels engine-location  wheel-base  ...  engine-
size  \
118  hatchback          fwd           front        93.7  ...
90
119  hatchback          fwd           front        93.7  ...
98
120  hatchback          fwd           front        93.7  ...
90
121      sedan          fwd           front        93.7  ...
90
122      sedan          fwd           front        93.7  ...
98
123      wagon          fwd           front       103.3  ...
122
124  hatchback          rwd           front        95.9  ...
```

```
156

     fuel-system  bore  stroke compression-ratio horsepower  peak-rpm
\
118         2bbl  2.97    3.23                9.4         68      5500

119         spdi  3.03    3.39                7.6        102      5500

120         2bbl  2.97    3.23                9.4         68      5500

121         2bbl  2.97    3.23                9.4         68      5500

122         2bbl  2.97    3.23                9.4         68      5500

123         2bbl  3.35    3.46                8.5         88      5000

124         spdi  3.59    3.86                7.0        145      5000


    city-mpg highway-mpg  price
118       37          41   5572
119       24          30   7957
120       31          38   6229
121       31          38   6692
122       31          38   7609
123       24          30   8921
124       19          24  12764

[7 rows x 26 columns]
```

Porshe

```
auto.drop(auto[auto['price']==0].index,
         axis=0,
         inplace=True)

auto.loc[(auto['make']=='porsche')&(auto['normalized-
losses']==0),'normalized-losses'] = 186

auto[auto['make']=='porsche']
```

```
     symboling  normalized-losses     make fuel-type aspiration num-
of-doors  \
125          3                186  porsche       gas        std
two
126          3                186  porsche       gas        std
two
```

```
127          3                186  porsche       gas        std
two
128          3                186  porsche       gas        std
two

      body-style drive-wheels engine-location  wheel-base  ...
engine-size  \
125    hatchback          rwd           front        94.5  ...
151
126      hardtop          rwd            rear        89.5  ...
194
127      hardtop          rwd            rear        89.5  ...
194
128  convertible          rwd            rear        89.5  ...
194

     fuel-system  bore  stroke compression-ratio horsepower  peak-rpm
\
125         mpfi  3.94    3.11               9.5        143      5500

126         mpfi  3.74    2.90               9.5        207      5900

127         mpfi  3.74    2.90               9.5        207      5900

128         mpfi  3.74    2.90               9.5        207      5900


    city-mpg highway-mpg  price
125       19          27  22018
126       17          25  32528
127       17          25  34028
128       17          25  37028

[4 rows x 26 columns]
```

Renault

```
auto[auto['make']=='renault']

     symboling  normalized-losses     make fuel-type aspiration num-
of-doors  \
130          0                  0  renault       gas        std
four
131          2                  0  renault       gas        std
two

    body-style drive-wheels engine-location  wheel-base  ...  engine-
```

```
size  \
130      wagon           fwd           front        96.1  ...
132
131  hatchback           fwd           front        96.1  ...
132

     fuel-system  bore  stroke compression-ratio horsepower  peak-rpm
\
130         mpfi  3.46    3.90               8.7        NaN       NaN

131         mpfi  3.46    3.90               8.7        NaN       NaN


    city-mpg highway-mpg price
130       23           31  9295
131       23           31  9895

[2 rows x 26 columns]
```

THis is the same condition as the Nissan maybe we will finding solution to it at the end of the session

Saab

```
auto[auto['make']=='saab']
```

```
     symboling  normalized-losses  make fuel-type aspiration num-of-
doors  \
132          3                150  saab       gas        std
two
133          2                104  saab       gas        std
four
134          3                150  saab       gas        std
two
135          2                104  saab       gas        std
four
136          3                150  saab       gas      turbo
two
137          2                104  saab       gas      turbo
four

    body-style drive-wheels engine-location  wheel-base  ...  engine-
size  \
132  hatchback          fwd           front        99.1  ...
121
133      sedan          fwd           front        99.1  ...
121
134  hatchback          fwd           front        99.1  ...
```

```
121
135      sedan           fwd           front        99.1  ...
121
136  hatchback           fwd           front        99.1  ...
121
137      sedan           fwd           front        99.1  ...
121

     fuel-system  bore  stroke compression-ratio horsepower  peak-rpm
\
132         mpfi  3.54    3.07              9.31        110      5250

133         mpfi  3.54    3.07              9.30        110      5250

134         mpfi  2.54    2.07              9.30        110      5250

135         mpfi  3.54    3.07              9.30        110      5250

136         mpfi  3.54    3.07              9.00        160      5500

137         mpfi  3.54    3.07              9.00        160      5500


    city-mpg highway-mpg  price
132       21          28  11850
133       21          28  12170
134       21          28  15040
135       21          28  15510
136       19          26  18150
137       19          26  18620

[6 rows x 26 columns]
```

Saab is actually very much fine

Subaru

```
auto[auto['make']=='subaru']

     symboling  normalized-losses    make fuel-type aspiration num-of-
doors  \
138          2                 83  subaru       gas        std
two
139          2                 83  subaru       gas        std
two
140          2                 83  subaru       gas        std
two
141          0                102  subaru       gas        std
four
```

```
142          0                102  subaru       gas        std
four
143          0                102  subaru       gas        std
four
144          0                102  subaru       gas        std
four
145          0                102  subaru       gas      turbo
four
146          0                 89  subaru       gas        std
four
147          0                 89  subaru       gas        std
four
148          0                 85  subaru       gas        std
four
149          0                 85  subaru       gas      turbo
four

    body-style drive-wheels engine-location  wheel-base  ...  engine-
size  \
138  hatchback          fwd           front        93.7  ...
97
139  hatchback          fwd           front        93.7  ...
108
140  hatchback          4wd           front        93.3  ...
108
141      sedan          fwd           front        97.2  ...
108
142      sedan          fwd           front        97.2  ...
108
143      sedan          fwd           front        97.2  ...
108
144      sedan          4wd           front        97.0  ...
108
145      sedan          4wd           front        97.0  ...
108
146      wagon          fwd           front        97.0  ...
108
147      wagon          fwd           front        97.0  ...
108
148      wagon          4wd           front        96.9  ...
108
149      wagon          4wd           front        96.9  ...
108

     fuel-system  bore  stroke compression-ratio horsepower  peak-rpm
\
138         2bbl  3.62    2.36                9.0         69      4900

139         2bbl  3.62    2.64                8.7         73      4400
```

```
140         2bbl  3.62    2.64                8.7          73      4400

141         2bbl  3.62    2.64                9.5          82      4800

142         2bbl  3.62    2.64                9.5          82      4400

143         mpfi  3.62    2.64                9.0          94      5200

144         2bbl  3.62    2.64                9.0          82      4800

145         mpfi  3.62    2.64                7.7         111      4800

146         2bbl  3.62    2.64                9.0          82      4800

147         mpfi  3.62    2.64                9.0          94      5200

148         2bbl  3.62    2.64                9.0          82      4800

149         mpfi  3.62    2.64                7.7         111      4800


    city-mpg highway-mpg  price
138       31          36   5118
139       26          31   7053
140       26          31   7603
141       32          37   7126
142       28          33   7775
143       26          32   9960
144       24          25   9233
145       24          29  11259
146       28          32   7463
147       25          31  10198
148       23          29   8013
149       23          23  11694

[12 rows x 26 columns]
```

Subaru is fine

Toyota

```
auto[auto['make']=='toyota']
```

```
     symboling  normalized-losses    make fuel-type aspiration num-of-
doors  \
150          1                 87  toyota       gas        std
two
151          1                 87  toyota       gas        std
two
```

```
152           1                  74  toyota       gas        std
four
153           0                  77  toyota       gas        std
four
154           0                  81  toyota       gas        std
four
155           0                  91  toyota       gas        std
four
156           0                  91  toyota       gas        std
four
157           0                  91  toyota       gas        std
four
158           0                  91  toyota    diesel        std
four
159           0                  91  toyota    diesel        std
four
160           0                  91  toyota       gas        std
four
161           0                  91  toyota       gas        std
four
162           0                  91  toyota       gas        std
four
163           1                 168  toyota       gas        std
two
164           1                 168  toyota       gas        std
two
165           1                 168  toyota       gas        std
two
166           1                 168  toyota       gas        std
two
167           2                 134  toyota       gas        std
two
168           2                 134  toyota       gas        std
two
169           2                 134  toyota       gas        std
two
170           2                 134  toyota       gas        std
two
171           2                 134  toyota       gas        std
two
172           2                 134  toyota       gas        std
two
173          -1                  65  toyota       gas        std
four
174          -1                  65  toyota    diesel      turbo
four
175          -1                  65  toyota       gas        std
four
176          -1                  65  toyota       gas        std
```

```
four
177         -1                 65  toyota       gas         std
four
178          3                197  toyota       gas         std
two
179          3                197  toyota       gas         std
two
180         -1                 90  toyota       gas         std
four
181         -1                  0  toyota       gas         std
four

      body-style drive-wheels engine-location  wheel-base  ...
engine-size  \
150    hatchback          fwd           front        95.7  ...
92
151    hatchback          fwd           front        95.7  ...
92
152    hatchback          fwd           front        95.7  ...
92
153        wagon          fwd           front        95.7  ...
92
154        wagon          4wd           front        95.7  ...
92
155        wagon          4wd           front        95.7  ...
92
156        sedan          fwd           front        95.7  ...
98
157    hatchback          fwd           front        95.7  ...
98
158        sedan          fwd           front        95.7  ...
110
159    hatchback          fwd           front        95.7  ...
110
160        sedan          fwd           front        95.7  ...
98
161    hatchback          fwd           front        95.7  ...
98
162        sedan          fwd           front        95.7  ...
98
163        sedan          rwd           front        94.5  ...
98
164    hatchback          rwd           front        94.5  ...
98
165        sedan          rwd           front        94.5  ...
98
166    hatchback          rwd           front        94.5  ...
98
167      hardtop          rwd           front        98.4  ...
```

```
146
168      hardtop           rwd           front        98.4  ...
146
169    hatchback           rwd           front        98.4  ...
146
170      hardtop           rwd           front        98.4  ...
146
171    hatchback           rwd           front        98.4  ...
146
172  convertible           rwd           front        98.4  ...
146
173        sedan           fwd           front       102.4  ...
122
174        sedan           fwd           front       102.4  ...
110
175    hatchback           fwd           front       102.4  ...
122
176        sedan           fwd           front       102.4  ...
122
177    hatchback           fwd           front       102.4  ...
122
178    hatchback           rwd           front       102.9  ...
171
179    hatchback           rwd           front       102.9  ...
171
180        sedan           rwd           front       104.5  ...
171
181        wagon           rwd           front       104.5  ...
161

     fuel-system  bore  stroke compression-ratio horsepower  peak-rpm
\
150         2bbl  3.05    3.03               9.0         62      4800

151         2bbl  3.05    3.03               9.0         62      4800

152         2bbl  3.05    3.03               9.0         62      4800

153         2bbl  3.05    3.03               9.0         62      4800

154         2bbl  3.05    3.03               9.0         62      4800

155         2bbl  3.05    3.03               9.0         62      4800

156         2bbl  3.19    3.03               9.0         70      4800

157         2bbl  3.19    3.03               9.0         70      4800

158          idi  3.27    3.35              22.5         56      4500
```

```
159          idi  3.27    3.35          22.5          56       4500
160         2bbl  3.19    3.03           9.0          70       4800
161         2bbl  3.19    3.03           9.0          70       4800
162         2bbl  3.19    3.03           9.0          70       4800
163         2bbl  3.19    3.03           9.0          70       4800
164         2bbl  3.19    3.03           9.0          70       4800
165         mpfi  3.24    3.08           9.4         112       6600
166         mpfi  3.24    3.08           9.4         112       6600
167         mpfi  3.62    3.50           9.3         116       4800
168         mpfi  3.62    3.50           9.3         116       4800
169         mpfi  3.62    3.50           9.3         116       4800
170         mpfi  3.62    3.50           9.3         116       4800
171         mpfi  3.62    3.50           9.3         116       4800
172         mpfi  3.62    3.50           9.3         116       4800
173         mpfi  3.31    3.54           8.7          92       4200
174          idi  3.27    3.35          22.5          73       4500
175         mpfi  3.31    3.54           8.7          92       4200
176         mpfi  3.31    3.54           8.7          92       4200
177         mpfi  3.31    3.54           8.7          92       4200
178         mpfi  3.27    3.35           9.3         161       5200
179         mpfi  3.27    3.35           9.3         161       5200
180         mpfi  3.27    3.35           9.2         156       5200
181         mpfi  3.27    3.35           9.2         156       5200


    city-mpg highway-mpg  price
150       35          39   5348
151       31          38   6338
152       31          38   6488
```

```
153       31           37   6918
154       27           32   7898
155       27           32   8778
156       30           37   6938
157       30           37   7198
158       34           36   7898
159       38           47   7788
160       38           47   7738
161       28           34   8358
162       28           34   9258
163       29           34   8058
164       29           34   8238
165       26           29   9298
166       26           29   9538
167       24           30   8449
168       24           30   9639
169       24           30   9989
170       24           30  11199
171       24           30  11549
172       24           30  17669
173       29           34   8948
174       30           33  10698
175       27           32   9988
176       27           32  10898
177       27           32  11248
178       20           24  16558
179       19           24  15998
180       20           24  15690
181       19           24  15750

[32 rows x 26 columns]
```

has only one left column to be filled inplace of normalized-losses

```
# mean of toyota

mean_toyota = auto[auto['make']=='toyota']['normalized-losses'].mean()
mean_toyota
```

```
106.84375
```

```
auto.loc[(auto['make']=='toyota') & (auto['normalized-
losses']==0) ,'normalized-losses'] = intmean_toyota)

auto[auto['make']=='toyota']
```

```
     symboling  normalized-losses    make fuel-type aspiration num-of-
doors  \
150          1           87.00000  toyota       gas        std
two
```

```
151          1           87.00000  toyota       gas        std
two
152          1           74.00000  toyota       gas        std
four
153          0           77.00000  toyota       gas        std
four
154          0           81.00000  toyota       gas        std
four
155          0           91.00000  toyota       gas        std
four
156          0           91.00000  toyota       gas        std
four
157          0           91.00000  toyota       gas        std
four
158          0           91.00000  toyota    diesel        std
four
159          0           91.00000  toyota    diesel        std
four
160          0           91.00000  toyota       gas        std
four
161          0           91.00000  toyota       gas        std
four
162          0           91.00000  toyota       gas        std
four
163          1          168.00000  toyota       gas        std
two
164          1          168.00000  toyota       gas        std
two
165          1          168.00000  toyota       gas        std
two
166          1          168.00000  toyota       gas        std
two
167          2          134.00000  toyota       gas        std
two
168          2          134.00000  toyota       gas        std
two
169          2          134.00000  toyota       gas        std
two
170          2          134.00000  toyota       gas        std
two
171          2          134.00000  toyota       gas        std
two
172          2          134.00000  toyota       gas        std
two
173         -1           65.00000  toyota       gas        std
four
174         -1           65.00000  toyota    diesel      turbo
four
175         -1           65.00000  toyota       gas        std
```

```
four
176         -1           65.00000  toyota       gas        std
four
177         -1           65.00000  toyota       gas        std
four
178          3          197.00000  toyota       gas        std
two
179          3          197.00000  toyota       gas        std
two
180         -1           90.00000  toyota       gas        std
four
181         -1          106.84375  toyota       gas        std
four

      body-style drive-wheels engine-location  wheel-base  ...
engine-size  \
150    hatchback          fwd            front        95.7  ...
92
151    hatchback          fwd            front        95.7  ...
92
152    hatchback          fwd            front        95.7  ...
92
153        wagon          fwd            front        95.7  ...
92
154        wagon          4wd            front        95.7  ...
92
155        wagon          4wd            front        95.7  ...
92
156        sedan          fwd            front        95.7  ...
98
157    hatchback          fwd            front        95.7  ...
98
158        sedan          fwd            front        95.7  ...
110
159    hatchback          fwd            front        95.7  ...
110
160        sedan          fwd            front        95.7  ...
98
161    hatchback          fwd            front        95.7  ...
98
162        sedan          fwd            front        95.7  ...
98
163        sedan          rwd            front        94.5  ...
98
164    hatchback          rwd            front        94.5  ...
98
165        sedan          rwd            front        94.5  ...
98
166    hatchback          rwd            front        94.5  ...
```

```
98
167      hardtop           rwd           front        98.4  ...
146
168      hardtop           rwd           front        98.4  ...
146
169    hatchback           rwd           front        98.4  ...
146
170      hardtop           rwd           front        98.4  ...
146
171    hatchback           rwd           front        98.4  ...
146
172  convertible           rwd           front        98.4  ...
146
173        sedan           fwd           front       102.4  ...
122
174        sedan           fwd           front       102.4  ...
110
175    hatchback           fwd           front       102.4  ...
122
176        sedan           fwd           front       102.4  ...
122
177    hatchback           fwd           front       102.4  ...
122
178    hatchback           rwd           front       102.9  ...
171
179    hatchback           rwd           front       102.9  ...
171
180        sedan           rwd           front       104.5  ...
171
181        wagon           rwd           front       104.5  ...
161

     fuel-system  bore  stroke compression-ratio horsepower  peak-rpm
\
150         2bbl  3.05    3.03               9.0         62      4800

151         2bbl  3.05    3.03               9.0         62      4800

152         2bbl  3.05    3.03               9.0         62      4800

153         2bbl  3.05    3.03               9.0         62      4800

154         2bbl  3.05    3.03               9.0         62      4800

155         2bbl  3.05    3.03               9.0         62      4800

156         2bbl  3.19    3.03               9.0         70      4800

157         2bbl  3.19    3.03               9.0         70      4800
```

158	idi	3.27	3.35	22.5	56	4500
159	idi	3.27	3.35	22.5	56	4500
160	2bbl	3.19	3.03	9.0	70	4800
161	2bbl	3.19	3.03	9.0	70	4800
162	2bbl	3.19	3.03	9.0	70	4800
163	2bbl	3.19	3.03	9.0	70	4800
164	2bbl	3.19	3.03	9.0	70	4800
165	mpfi	3.24	3.08	9.4	112	6600
166	mpfi	3.24	3.08	9.4	112	6600
167	mpfi	3.62	3.50	9.3	116	4800
168	mpfi	3.62	3.50	9.3	116	4800
169	mpfi	3.62	3.50	9.3	116	4800
170	mpfi	3.62	3.50	9.3	116	4800
171	mpfi	3.62	3.50	9.3	116	4800
172	mpfi	3.62	3.50	9.3	116	4800
173	mpfi	3.31	3.54	8.7	92	4200
174	idi	3.27	3.35	22.5	73	4500
175	mpfi	3.31	3.54	8.7	92	4200
176	mpfi	3.31	3.54	8.7	92	4200
177	mpfi	3.31	3.54	8.7	92	4200
178	mpfi	3.27	3.35	9.3	161	5200
179	mpfi	3.27	3.35	9.3	161	5200
180	mpfi	3.27	3.35	9.2	156	5200
181	mpfi	3.27	3.35	9.2	156	5200

	city-mpg	highway-mpg	price
150	35	39	5348
151	31	38	6338

```
152       31           38   6488
153       31           37   6918
154       27           32   7898
155       27           32   8778
156       30           37   6938
157       30           37   7198
158       34           36   7898
159       38           47   7788
160       38           47   7738
161       28           34   8358
162       28           34   9258
163       29           34   8058
164       29           34   8238
165       26           29   9298
166       26           29   9538
167       24           30   8449
168       24           30   9639
169       24           30   9989
170       24           30  11199
171       24           30  11549
172       24           30  17669
173       29           34   8948
174       30           33  10698
175       27           32   9988
176       27           32  10898
177       27           32  11248
178       20           24  16558
179       19           24  15998
180       20           24  15690
181       19           24  15750

[32 rows x 26 columns]
```

Volkswagen

```
auto[auto['make']=='volkswagen']
```

```
     symboling  normalized-losses        make fuel-type aspiration  \
182          2              122.0  volkswagen    diesel        std
183          2              122.0  volkswagen       gas        std
184          2               94.0  volkswagen    diesel        std
185          2               94.0  volkswagen       gas        std
186          2               94.0  volkswagen       gas        std
187          2               94.0  volkswagen    diesel      turbo
188          2               94.0  volkswagen       gas        std
189          3                0.0  volkswagen       gas        std
```

```
190          3              256.0  volkswagen       gas        std
191          0                0.0  volkswagen       gas        std
192          0                0.0  volkswagen    diesel      turbo
193          0                0.0  volkswagen       gas        std

    num-of-doors   body-style drive-wheels engine-location  wheel-base
...  \
182          two        sedan          fwd           front        97.3
...
183          two        sedan          fwd           front        97.3
...
184         four        sedan          fwd           front        97.3
...
185         four        sedan          fwd           front        97.3
...
186         four        sedan          fwd           front        97.3
...
187         four        sedan          fwd           front        97.3
...
188         four        sedan          fwd           front        97.3
...
189          two  convertible          fwd           front        94.5
...
190          two    hatchback          fwd           front        94.5
...
191         four        sedan          fwd           front       100.4
...
192         four        sedan          fwd           front       100.4
...
193         four        wagon          fwd           front       100.4
...

     engine-size  fuel-system  bore  stroke compression-ratio
horsepower  \
182           97          idi  3.01    3.40              23.0
52
183          109         mpfi  3.19    3.40               9.0
85
184           97          idi  3.01    3.40              23.0
52
185          109         mpfi  3.19    3.40               9.0
85
186          109         mpfi  3.19    3.40               9.0
85
187           97          idi  3.01    3.40              23.0
68
188          109         mpfi  3.19    3.40              10.0
100
189          109         mpfi  3.19    3.40               8.5
```

```
90
190          109          mpfi  3.19    3.40                8.5
90
191          136          mpfi  3.19    3.40                8.5
110
192           97           idi  3.01    3.40               23.0
68
193          109          mpfi  3.19    3.40                9.0
88
```

```
     peak-rpm city-mpg highway-mpg  price
182      4800       37          46   7775
183      5250       27          34   7975
184      4800       37          46   7995
185      5250       27          34   8195
186      5250       27          34   8495
187      4500       37          42   9495
188      5500       26          32   9995
189      5500       24          29  11595
190      5500       24          29   9980
191      5500       19          24  13295
192      4500       33          38  13845
193      5500       25          31  12290

[12 rows x 26 columns]
```

```
# median of volks

median_volkswagen = auto[auto['make']=='volkswagen']['normalized-
losses'].median()
median_volkswagen
```

```
94.0
```

```
auto.loc[(auto['make']=='volkswagen') & (auto['normalized-losses']==0)
,'normalized-losses'] = median_volkswagen

auto[auto['make']=='volkswagen']
```

```
     symboling  normalized-losses        make fuel-type aspiration  \
182          2              122.0  volkswagen    diesel        std
183          2              122.0  volkswagen       gas        std
184          2               94.0  volkswagen    diesel        std
185          2               94.0  volkswagen       gas        std
186          2               94.0  volkswagen       gas        std
187          2               94.0  volkswagen    diesel      turbo
188          2               94.0  volkswagen       gas        std
189          3               94.0  volkswagen       gas        std
190          3              256.0  volkswagen       gas        std
191          0               94.0  volkswagen       gas        std
192          0               94.0  volkswagen    diesel      turbo
```

```
193          0               94.0  volkswagen       gas        std

    num-of-doors   body-style drive-wheels engine-location  wheel-base
...  \
182          two        sedan          fwd           front        97.3
...
183          two        sedan          fwd           front        97.3
...
184         four        sedan          fwd           front        97.3
...
185         four        sedan          fwd           front        97.3
...
186         four        sedan          fwd           front        97.3
...
187         four        sedan          fwd           front        97.3
...
188         four        sedan          fwd           front        97.3
...
189          two  convertible          fwd           front        94.5
...
190          two    hatchback          fwd           front        94.5
...
191         four        sedan          fwd           front       100.4
...
192         four        sedan          fwd           front       100.4
...
193         four        wagon          fwd           front       100.4
...

     engine-size  fuel-system  bore  stroke compression-ratio
horsepower  \
182           97          idi  3.01    3.40              23.0
52
183          109         mpfi  3.19    3.40               9.0
85
184           97          idi  3.01    3.40              23.0
52
185          109         mpfi  3.19    3.40               9.0
85
186          109         mpfi  3.19    3.40               9.0
85
187           97          idi  3.01    3.40              23.0
68
188          109         mpfi  3.19    3.40              10.0
100
189          109         mpfi  3.19    3.40               8.5
90
190          109         mpfi  3.19    3.40               8.5
90
```

```
191          136          mpfi  3.19    3.40                8.5
110
192           97           idi  3.01    3.40               23.0
68
193          109          mpfi  3.19    3.40                9.0
88

     peak-rpm city-mpg highway-mpg  price
182      4800       37          46   7775
183      5250       27          34   7975
184      4800       37          46   7995
185      5250       27          34   8195
186      5250       27          34   8495
187      4500       37          42   9495
188      5500       26          32   9995
189      5500       24          29  11595
190      5500       24          29   9980
191      5500       19          24  13295
192      4500       33          38  13845
193      5500       25          31  12290

[12 rows x 26 columns]
```

VW is actually very fine

Volvo

```
auto[auto['make']=='volvo']
```

```
     symboling  normalized-losses   make fuel-type aspiration num-of-
doors  \
194         -2              103.0  volvo       gas        std
four
195         -1               74.0  volvo       gas        std
four
196         -2              103.0  volvo       gas        std
four
197         -1               74.0  volvo       gas        std
four
198         -2              103.0  volvo       gas      turbo
four
199         -1               74.0  volvo       gas      turbo
four
200         -1               95.0  volvo       gas        std
four
201         -1               95.0  volvo       gas      turbo
four
```

```
202         -1               95.0  volvo       gas        std
four
203         -1               95.0  volvo    diesel      turbo
four
204         -1               95.0  volvo       gas      turbo
four

    body-style drive-wheels engine-location  wheel-base  ...  engine-
size  \
194      sedan          rwd           front       104.3  ...
141
195      wagon          rwd           front       104.3  ...
141
196      sedan          rwd           front       104.3  ...
141
197      wagon          rwd           front       104.3  ...
141
198      sedan          rwd           front       104.3  ...
130
199      wagon          rwd           front       104.3  ...
130
200      sedan          rwd           front       109.1  ...
141
201      sedan          rwd           front       109.1  ...
141
202      sedan          rwd           front       109.1  ...
173
203      sedan          rwd           front       109.1  ...
145
204      sedan          rwd           front       109.1  ...
141

     fuel-system  bore  stroke compression-ratio horsepower  peak-rpm
\
194         mpfi  3.78    3.15               9.5        114      5400

195         mpfi  3.78    3.15               9.5        114      5400

196         mpfi  3.78    3.15               9.5        114      5400

197         mpfi  3.78    3.15               9.5        114      5400

198         mpfi  3.62    3.15               7.5        162      5100

199         mpfi  3.62    3.15               7.5        162      5100

200         mpfi  3.78    3.15               9.5        114      5400

201         mpfi  3.78    3.15               8.7        160      5300
```

```
202         mpfi  3.58    2.87                 8.8         134       5500

203          idi  3.01    3.40                23.0         106       4800

204         mpfi  3.78    3.15                 9.5         114       5400


    city-mpg highway-mpg  price
194       23          28  12940
195       23          28  13415
196       24          28  15985
197       24          28  16515
198       17          22  18420
199       17          22  18950
200       23          28  16845
201       19          25  19045
202       18          23  21485
203       26          27  22470
204       19          25  22625

[11 rows x 26 columns]
```

Volvo a good one

We now tend to those missing values in the normalised column which does not have any kind of values of whatsoever and then now we insert in the median or mode or mean into the empty values

```
final_median_nrml_lss = auto['normalized-losses'].median()
final_median_nrml_lss
```

```
118.0
```

```
auto.loc[(auto['normalized-losses']==0),'normalized-losses'] =
final_median_nrml_lss

auto.isna().sum()
```

```
symboling            0
normalized-losses    0
make                 0
fuel-type            0
aspiration           0
num-of-doors         2
body-style           0
```

```
drive-wheels          0
engine-location       0
wheel-base            0
length                0
width                 0
height                0
curb-weight           0
engine-type           0
num-of-cylinders      0
engine-size           0
fuel-system           0
bore                  4
stroke                4
compression-ratio     0
horsepower            2
peak-rpm              2
city-mpg              0
highway-mpg           0
price                 0
dtype: int64
```

```
auto['num-of-doors'].replace('two',2,inplace=True)
```

```
auto['num-of-doors'].replace('four',4,inplace=True)
```

```
auto['num-of-doors'].unique()
```

```
array([  2.,   4.,  nan, 109.])
```

```
auto['num-of-doors'].median()
```

```
4.0
```

```
auto['num-of-doors'] = auto['num-of-doors'].fillna(4)
```

```
auto['num-of-doors'].unique()
```

```
array([  2.,   4., 109.])
```

```
auto['num-of-doors'].dtype
```

```
dtype('float64')
```

```
auto.isna().sum()
```

```
symboling             0
normalized-losses     0
make                  0
fuel-type             0
aspiration            0
num-of-doors          0
body-style            0
```

```
drive-wheels          0
engine-location       0
wheel-base            0
length                0
width                 0
height                0
curb-weight           0
engine-type           0
num-of-cylinders      0
engine-size           0
fuel-system           0
bore                  4
stroke                4
compression-ratio     0
horsepower            2
peak-rpm              2
city-mpg              0
highway-mpg           0
price                 0
dtype: int64
```

```
auto['bore'].isna().sum()
```

```
4
```

```
auto['bore'].unique()
```

```
array(['3.47', '2.68', '3.19', '3.13', '3.50', '3.31', '3.62', '2.91',
       '3.03', '2.97', '3.34', '3.60', '2.92', '3.15', '3.43', '3.63',
       '3.54', '3.08', nan, '3.39', '3.76', 109, '3.58', '3.46',
'3.80',
       '3.78', '3.17', '3.35', '3.59', '2.99', '3.33', '3.70', '3.61',
       '3.94', '3.74', '2.54', '3.05', '3.27', '3.24', '3.01'],
      dtype=object)
```

```
median_of_bore = auto['bore'].median()
```

```
auto['bore'] = auto['bore'].fillna(median_of_bore).astype(float)
```

```
auto['bore'].isna().sum()
```

```
0
```

```
auto['stroke'].isna().sum()
```

```
4
```

```
auto['stroke'].unique()
```

```
array(['2.68', '3.47', '3.40', '2.80', '3.19', '3.39', '3.03', '3.11',
       '3.23', '3.46', '3.90', '3.41', '3.07', '3.58', '4.17', '2.76',
       '3.15', nan, '3.16', 109, '3.64', '3.10', '3.35', '3.12',
```

```
'3.86',
       '3.29', '3.27', '3.52', '2.19', '3.21', '2.90', '2.07', '2.36',
       '2.64', '3.08', '3.50', '3.54', '2.87'], dtype=object)
```

```
median_of_stroke = auto['stroke'].median()
median_of_stroke
```

```
3.29
```

```
auto['stroke'] = auto['stroke'].fillna(median_of_stroke).astype(float)
```

```
auto['stroke'].isna().sum()
```

```
0
```

```
auto['horsepower'].isna().sum()
```

```
0
```

```
median_of_HP = auto['horsepower'].median()
median_of_HP
```

```
95.0
```

```
auto['horsepower'].dtype
```

```
dtype('float64')
```

```
auto['horsepower'] =
auto['horsepower'].fillna(median_of_HP).astype(float)
```

```
auto['horsepower'].isna().sum()
```

```
0
```

```
auto['peak-rpm'].isna().sum()
```

```
0
```

```
auto['peak-rpm'].unique()
```

```
array([5000., 5500., 5800., 4250., 5400., 5100., 4800., 6000., 4750.,
       4650.,  109., 4350., 4500., 5200., 4150., 5600., 5900., 5250.,
       4900., 4400., 6600., 4200., 5300.])
```

```
median_of_pkrpm = auto['peak-rpm'].median()
median_of_pkrpm
```

```
5200.0
```

```
auto['peak-rpm'] = auto['peak-
rpm'].fillna(median_of_pkrpm).astype(float)
```

```
auto['peak-rpm'].isna().sum()
```

```
0
```

```
auto.isna().sum()
```

```
symboling            0
normalized-losses    0
make                 0
fuel-type            0
aspiration           0
num-of-doors         0
body-style           0
drive-wheels         0
engine-location      0
wheel-base           0
length               0
width                0
height               0
curb-weight          0
engine-type          0
num-of-cylinders     0
engine-size          0
fuel-system          0
bore                 0
stroke               0
compression-ratio    0
horsepower           0
peak-rpm             0
city-mpg             0
highway-mpg          0
price                0
dtype: int64
```

```
auto
```

```
     symboling  normalized-losses         make fuel-type aspiration  \
0            3              118.0  alfa-romero       gas        std
1            3              118.0  alfa-romero       gas        std
2            1              118.0  alfa-romero       gas        std
3            2              164.0         audi       gas        std
4            2              164.0         audi       gas        std
..         ...                ...          ...       ...        ...
200         -1               95.0        volvo       gas        std
201         -1               95.0        volvo       gas      turbo
202         -1               95.0        volvo       gas        std
203         -1               95.0        volvo    diesel      turbo
204         -1               95.0        volvo       gas      turbo

     num-of-doors   body-style drive-wheels engine-location  wheel-
base  ...  \
0             2.0  convertible          rwd           front
```

```
88.6  ...
1             2.0  convertible          rwd           front
88.6  ...
2             2.0    hatchback          rwd           front
94.5  ...
3             4.0        sedan          fwd           front
99.8  ...
4             4.0        sedan          4wd           front
99.4  ...
..            ...          ...          ...             ...          ..
.  ...
200           4.0        sedan          rwd           front
109.1  ...
201           4.0        sedan          rwd           front
109.1  ...
202           4.0        sedan          rwd           front
109.1  ...
203           4.0        sedan          rwd           front
109.1  ...
204           4.0        sedan          rwd           front
109.1  ...

     engine-size  fuel-system  bore  stroke compression-ratio
horsepower  \
0            130         mpfi  3.47    2.68                9.0
111.0
1            130         mpfi  3.47    2.68                9.0
111.0
2            152         mpfi  2.68    3.47                9.0
154.0
3            109         mpfi  3.19    3.40               10.0
102.0
4            136         mpfi  3.19    3.40                8.0
115.0
..           ...          ...   ...     ...                ...         .
..
200          141         mpfi  3.78    3.15                9.5
114.0
201          141         mpfi  3.78    3.15                8.7
160.0
202          173         mpfi  3.58    2.87                8.8
134.0
203          145          idi  3.01    3.40               23.0
106.0
204          141         mpfi  3.78    3.15                9.5
114.0

     peak-rpm city-mpg  highway-mpg  price
0      5000.0       21           27  13495
```

```
1      5000.0       21           27  16500
2      5000.0       19           26  16500
3      5500.0       24           30  13950
4      5500.0       18           22  17450
..        ...      ...          ...    ...
200    5400.0       23           28  16845
201    5300.0       19           25  19045
202    5500.0       18           23  21485
203    4800.0       26           27  22470
204    5400.0       19           25  22625

[201 rows x 26 columns]
```

```
auto['engine-type'].unique()
```

```
array(['dohc', 'ohcv', 'ohc', 'l', 'rotor', 109, 'ohcf'],
dtype=object)
```

```
auto['num-of-cylinders'].unique()
```

```
array(['four', 'six', 'five', 'three', 'twelve', 'two', 109, 'eight'],
      dtype=object)
```

```
auto['num-of-cylinders'].dtype
```

```
dtype('O')
```

```
!pip  install word2number
```

```
Defaulting to user installation because normal site-packages is not
writeable
Requirement already satisfied: word2number in c:\users\preda\appdata\
roaming\python\python311\site-packages (1.1)
```

```
from word2number import w2n
```

```
auto['num-of-cylinders'] = auto['num-of-cylinders'].astype(str)
```

```
auto['num-of-cylinders'] = auto['num-of-
cylinders'].apply(w2n.word_to_num)
```

```
auto['num-of-cylinders'].dtype
```

```
dtype('int64')
```

```
auto
```

```
     symboling  normalized-losses         make fuel-type aspiration  \
0            3              118.0  alfa-romero       gas        std
1            3              118.0  alfa-romero       gas        std
2            1              118.0  alfa-romero       gas        std
3            2              164.0         audi       gas        std
4            2              164.0         audi       gas        std
```

```
..          ...                ...          ...       ...         ...
200         -1                95.0        volvo       gas         std
201         -1                95.0        volvo       gas       turbo
202         -1                95.0        volvo       gas         std
203         -1                95.0        volvo    diesel       turbo
204         -1                95.0        volvo       gas       turbo

     num-of-doors   body-style drive-wheels engine-location  wheel-
base  ...  \
0             2.0  convertible          rwd           front
88.6  ...
1             2.0  convertible          rwd           front
88.6  ...
2             2.0    hatchback          rwd           front
94.5  ...
3             4.0        sedan          fwd           front
99.8  ...
4             4.0        sedan          4wd           front
99.4  ...
..            ...          ...          ...             ...          ..
.  ...
200           4.0        sedan          rwd           front
109.1  ...
201           4.0        sedan          rwd           front
109.1  ...
202           4.0        sedan          rwd           front
109.1  ...
203           4.0        sedan          rwd           front
109.1  ...
204           4.0        sedan          rwd           front
109.1  ...

     engine-size  fuel-system  bore  stroke compression-ratio
horsepower  \
0            130         mpfi  3.47    2.68              9.0
111.0
1            130         mpfi  3.47    2.68              9.0
111.0
2            152         mpfi  2.68    3.47              9.0
154.0
3            109         mpfi  3.19    3.40             10.0
102.0
4            136         mpfi  3.19    3.40              8.0
115.0
..           ...          ...   ...     ...              ...
...
200          141         mpfi  3.78    3.15              9.5
114.0
201          141         mpfi  3.78    3.15              8.7
```

```
160.0
202          173          mpfi  3.58    2.87                8.8
134.0
203          145           idi  3.01    3.40               23.0
106.0
204          141          mpfi  3.78    3.15                9.5
114.0

     peak-rpm city-mpg  highway-mpg  price
0      5000.0       21           27  13495
1      5000.0       21           27  16500
2      5000.0       19           26  16500
3      5500.0       24           30  13950
4      5500.0       18           22  17450
..        ...      ...          ...    ...
200    5400.0       23           28  16845
201    5300.0       19           25  19045
202    5500.0       18           23  21485
203    4800.0       26           27  22470
204    5400.0       19           25  22625

[201 rows x 26 columns]
```

```
auto.to_csv('automobiles.csv',index=False)
```