CAR PRICE PREDICTION _____

ABOUT DATASET

The dataset is used to predict the price of a car. It contains 205 rows and 26 columns such as car_ID,symboling,CarName,fueltype,aspiration,doornumber,carbody,drivewheel,enginelocation ,wheelbase,carlength,carwidth,carheight, curbweight,enginetype,cylindernumber,enginesize,fuelsystem,boreratio,stroke, compressionratio,horsepower,peakrpm,citympg,highwaympg,price.

IMPORTING PYTHON LIBRARIES

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.preprocessing import LabelEncoder
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression
from sklearn.metrics import mean_absolute_percentage_error
from sklearn.metrics import mean_absolute_error
from sklearn.metrics import mean_squared_error
from sklearn.metrics import r2_score
```

LOADING DATASET

```
df=pd.read_csv('/home/anusha/Desktop/CarPrice_Assignment.csv')
df
```

```
     car_ID  symboling                   CarName fueltype
aspiration  \
0         1          3        alfa-romero giulia      gas        std

1         2          3       alfa-romero stelvio      gas        std

2         3          1  alfa-romero Quadrifoglio      gas        std

3         4          2               audi 100 ls      gas        std

4         5          2                audi 100ls      gas        std

..      ...        ...                       ...      ...        ...

200     201         -1           volvo 145e (sw)      gas        std

201     202         -1               volvo 144ea      gas      turbo

202     203         -1               volvo 244dl      gas        std

203     204         -1                 volvo 246   diesel      turbo
```

```
204     205         -1                volvo 264gl      gas       turbo

    doornumber      carbody drivewheel enginelocation  wheelbase  ...
\
0          two  convertible        rwd           front       88.6  ...

1          two  convertible        rwd           front       88.6  ...

2          two    hatchback        rwd           front       94.5  ...

3         four        sedan        fwd           front       99.8  ...

4         four        sedan        4wd           front       99.4  ...

..         ...          ...        ...             ...        ...  ...

200       four        sedan        rwd           front      109.1  ...

201       four        sedan        rwd           front      109.1  ...

202       four        sedan        rwd           front      109.1  ...

203       four        sedan        rwd           front      109.1  ...

204       four        sedan        rwd           front      109.1  ...


     enginesize  fuelsystem  boreratio  stroke compressionratio
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
3           109        mpfi       3.19    3.40              10.0
102
4           136        mpfi       3.19    3.40               8.0
115
..          ...         ...        ...     ...               ...
...
200         141        mpfi       3.78    3.15               9.5
114
201         141        mpfi       3.78    3.15               8.7
160
202         173        mpfi       3.58    2.87               8.8
134
203         145         idi       3.01    3.40              23.0
106
```

```
204         141        mpfi       3.78    3.15              9.5
114

     peakrpm citympg  highwaympg    price
0       5000      21          27  13495.0
1       5000      21          27  16500.0
2       5000      19          26  16500.0
3       5500      24          30  13950.0
4       5500      18          22  17450.0
..       ...     ...         ...      ...
200     5400      23          28  16845.0
201     5300      19          25  19045.0
202     5500      18          23  21485.0
203     4800      26          27  22470.0
204     5400      19          25  22625.0

[205 rows x 26 columns]
```

DATA PREPROCESSING

```
df.head()

   car_ID  symboling                   CarName fueltype aspiration
doornumber  \
0       1          3        alfa-romero giulia      gas        std
two
1       2          3       alfa-romero stelvio      gas        std
two
2       3          1  alfa-romero Quadrifoglio      gas        std
two
3       4          2               audi 100 ls      gas        std
four
4       5          2                audi 100ls      gas        std
four

       carbody drivewheel enginelocation  wheelbase  ...
enginesize  \
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


   fuelsystem  boreratio  stroke compressionratio horsepower  peakrpm
citympg  \
```

```
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

   highwaympg    price
0          27  13495.0
1          27  16500.0
2          26  16500.0
3          30  13950.0
4          22  17450.0

[5 rows x 26 columns]
```

```
df.tail()
```

```
     car_ID  symboling          CarName fueltype aspiration doornumber
\
200     201         -1  volvo 145e (sw)      gas        std       four

201     202         -1      volvo 144ea      gas      turbo       four

202     203         -1      volvo 244dl      gas        std       four

203     204         -1        volvo 246   diesel      turbo       four

204     205         -1      volvo 264gl      gas      turbo       four


    carbody drivewheel enginelocation  wheelbase  ...  enginesize
fuelsystem  \
200   sedan        rwd          front      109.1  ...         141
mpfi
201   sedan        rwd          front      109.1  ...         141
mpfi
202   sedan        rwd          front      109.1  ...         173
mpfi
203   sedan        rwd          front      109.1  ...         145
idi
204   sedan        rwd          front      109.1  ...         141
mpfi

     boreratio  stroke compressionratio horsepower  peakrpm citympg  \
200       3.78    3.15              9.5        114     5400      23
201       3.78    3.15              8.7        160     5300      19
```

```
202       3.58    2.87              8.8        134     5500      18
203       3.01    3.40             23.0        106     4800      26
204       3.78    3.15              9.5        114     5400      19

     highwaympg    price
200          28  16845.0
201          25  19045.0
202          23  21485.0
203          27  22470.0
204          25  22625.0

[5 rows x 26 columns]
```

```
df.shape
```

```
(205, 26)
```

```
df.columns
```

```
Index(['car_ID', 'symboling', 'CarName', 'fueltype', 'aspiration',
       'doornumber', 'carbody', 'drivewheel', 'enginelocation',
'wheelbase',
       'carlength', 'carwidth', 'carheight', 'curbweight',
'enginetype',
       'cylindernumber', 'enginesize', 'fuelsystem', 'boreratio',
'stroke',
       'compressionratio', 'horsepower', 'peakrpm', 'citympg',
'highwaympg',
       'price'],
      dtype='object')
```

```
df.dtypes
```

```
car_ID                int64
symboling             int64
CarName              object
fueltype             object
aspiration           object
doornumber           object
carbody              object
drivewheel           object
enginelocation       object
wheelbase           float64
carlength           float64
carwidth            float64
carheight           float64
curbweight            int64
enginetype           object
cylindernumber       object
enginesize            int64
fuelsystem           object
```

```
boreratio           float64
stroke              float64
compressionratio    float64
horsepower            int64
peakrpm               int64
citympg               int64
highwaympg            int64
price               float64
dtype: object
```

Here CarName,fueltype,aspirationt,doornumber,carbody,drivewheel,enginelocation,enginetype,cylindernumber,fuelsystem are objects.

```
df.isna().sum()
```

```
car_ID              0
symboling           0
CarName             0
fueltype            0
aspiration          0
doornumber          0
carbody             0
drivewheel          0
enginelocation      0
wheelbase           0
carlength           0
carwidth            0
carheight           0
curbweight          0
enginetype          0
cylindernumber      0
enginesize          0
fuelsystem          0
boreratio           0
stroke              0
compressionratio    0
horsepower          0
peakrpm             0
citympg             0
highwaympg          0
price               0
dtype: int64
```

No missing values are found

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 205 entries, 0 to 204
Data columns (total 26 columns):
 #   Column            Non-Null Count  Dtype  
---  ------            --------------  -----  
 0   car_ID            205 non-null    int64  
 1   symboling         205 non-null    int64  
 2   CarName           205 non-null    object 
 3   fueltype          205 non-null    object 
 4   aspiration        205 non-null    object 
 5   doornumber        205 non-null    object 
 6   carbody           205 non-null    object 
 7   drivewheel        205 non-null    object 
 8   enginelocation    205 non-null    object 
 9   wheelbase         205 non-null    float64
 10  carlength         205 non-null    float64
 11  carwidth          205 non-null    float64
 12  carheight         205 non-null    float64
 13  curbweight        205 non-null    int64  
 14  enginetype        205 non-null    object 
 15  cylindernumber    205 non-null    object 
 16  enginesize        205 non-null    int64  
 17  fuelsystem        205 non-null    object 
 18  boreratio         205 non-null    float64
 19  stroke            205 non-null    float64
 20  compressionratio  205 non-null    float64
 21  horsepower        205 non-null    int64  
 22  peakrpm           205 non-null    int64  
 23  citympg           205 non-null    int64  
 24  highwaympg        205 non-null    int64  
 25  price             205 non-null    float64
dtypes: float64(8), int64(8), object(10)
memory usage: 41.8+ KB
```

DATA VISUALIZATION

```
df['CarName'].value_counts()
```

```
CarName
toyota corona           6
toyota corolla          6
peugeot 504             6
subaru dl               4
mitsubishi mirage g4    3
                       ..
mazda glc 4             1
mazda rx2 coupe         1
maxda glc deluxe        1
maxda rx3               1
```

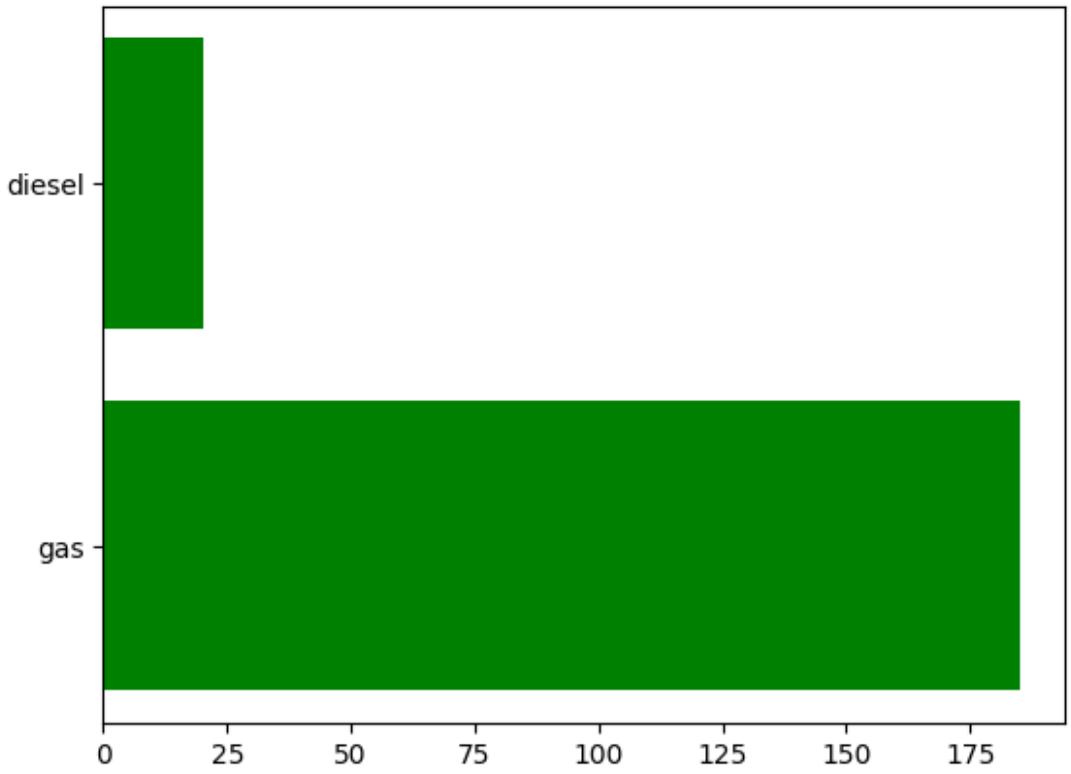
```
volvo 246                1
Name: count, Length: 147, dtype: int64
```

```
df['fueltype'].value_counts()
```

```
fueltype
gas       185
diesel     20
Name: count, dtype: int64
```

```
plt.barh(df['fueltype'].value_counts() .index,df['fueltype'].value_cou
nts(),color='green')
```

```
<BarContainer object of 2 artists>
```

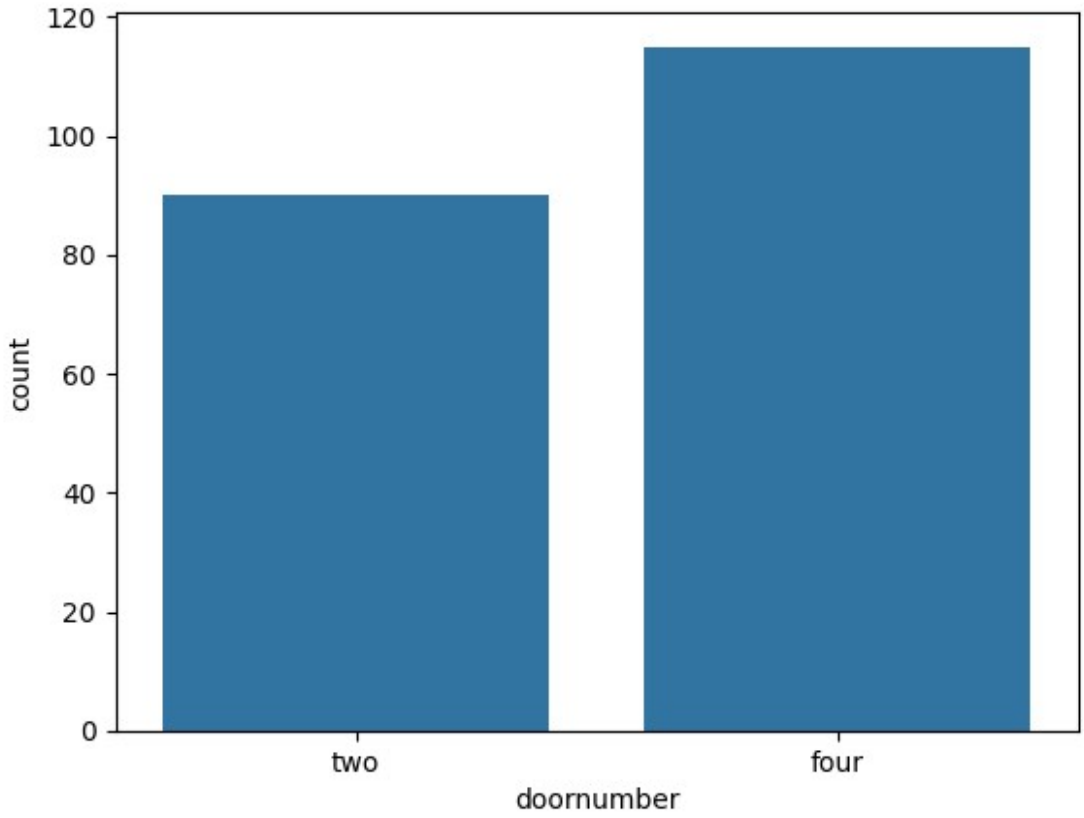



```
df['doornumber'].value_counts()
```

```
doornumber
four    115
two      90
Name: count, dtype: int64
```

```
sns.countplot(x=df['doornumber'])
```

```
<Axes: xlabel='doornumber', ylabel='count'>
```

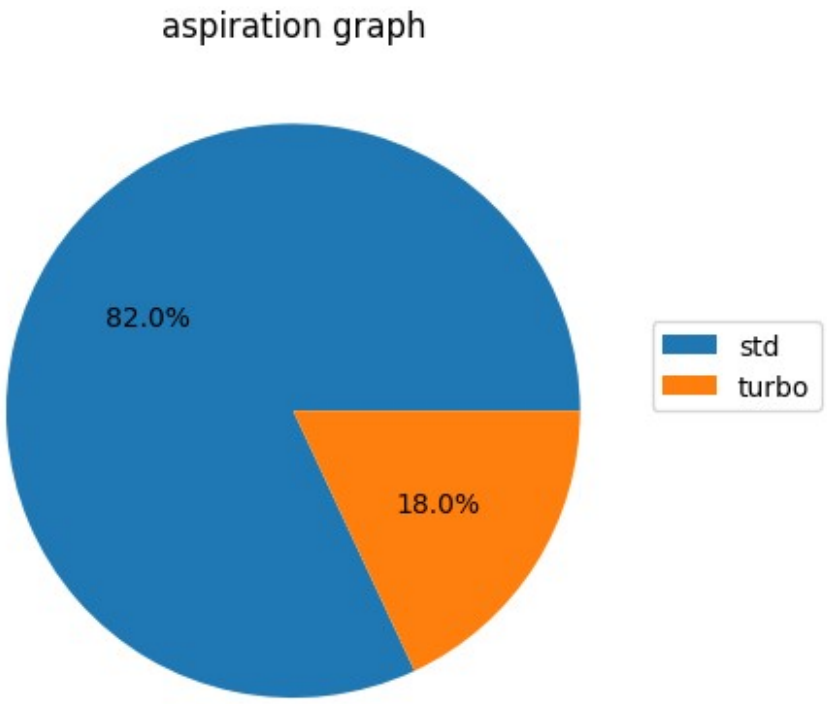



```
df['aspiration'].value_counts()
```

```
aspiration
std      168
turbo     37
Name: count, dtype: int64
```

```
plt.pie(df['aspiration'].value_counts(),autopct='%1.1f%%')
plt.legend(df['aspiration'].value_counts().index,loc=(1,0.5))
plt.title('aspiration graph',color='black')
```

```
Text(0.5, 1.0, 'aspiration graph')
```

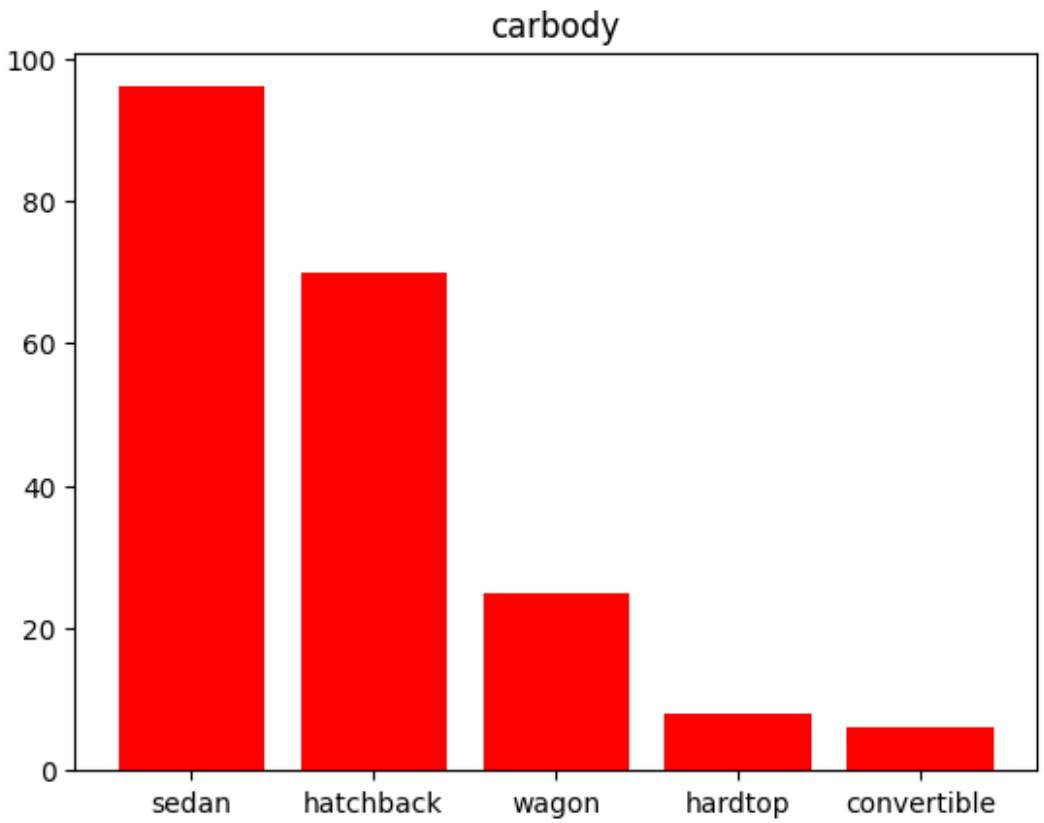



```
df['carbody'].value_counts()
```

```
carbody
sedan          96
hatchback      70
wagon          25
hardtop         8
convertible     6
Name: count, dtype: int64
```

```
plt.bar(df['carbody'].value_counts().index,df['carbody'].value_counts(
),color='red')
plt.title('carbody')
```

```
Text(0.5, 1.0, 'carbody')
```

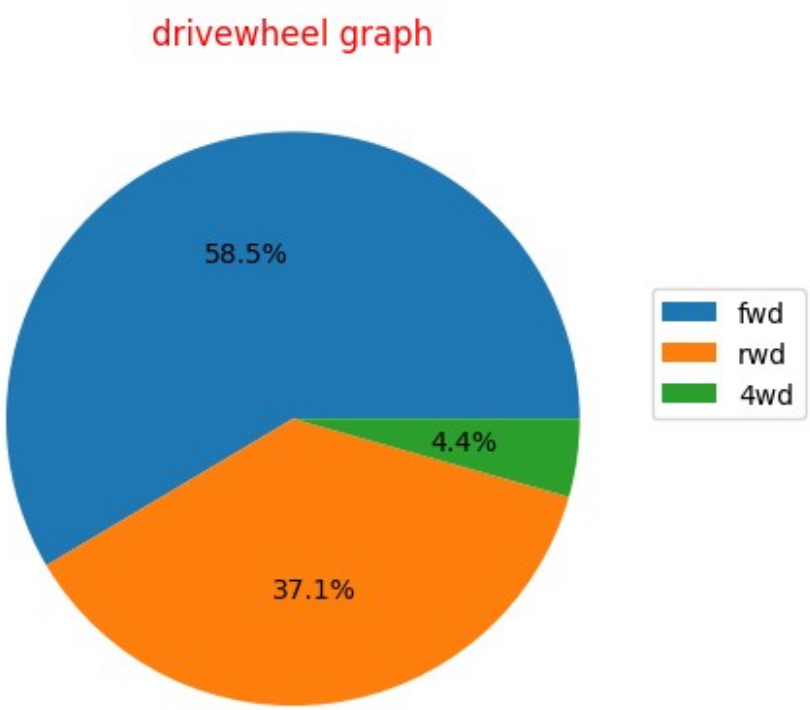



```
df['drivewheel'].value_counts()
```

```
drivewheel
fwd    120
rwd     76
4wd      9
Name: count, dtype: int64
```

```
plt.pie(df['drivewheel'].value_counts(),autopct='%1.1f%%')
plt.legend(df['drivewheel'].value_counts().index,loc=(1,0.5))
plt.title('drivewheel graph',color='red')
```

```
Text(0.5, 1.0, 'drivewheel graph')
```

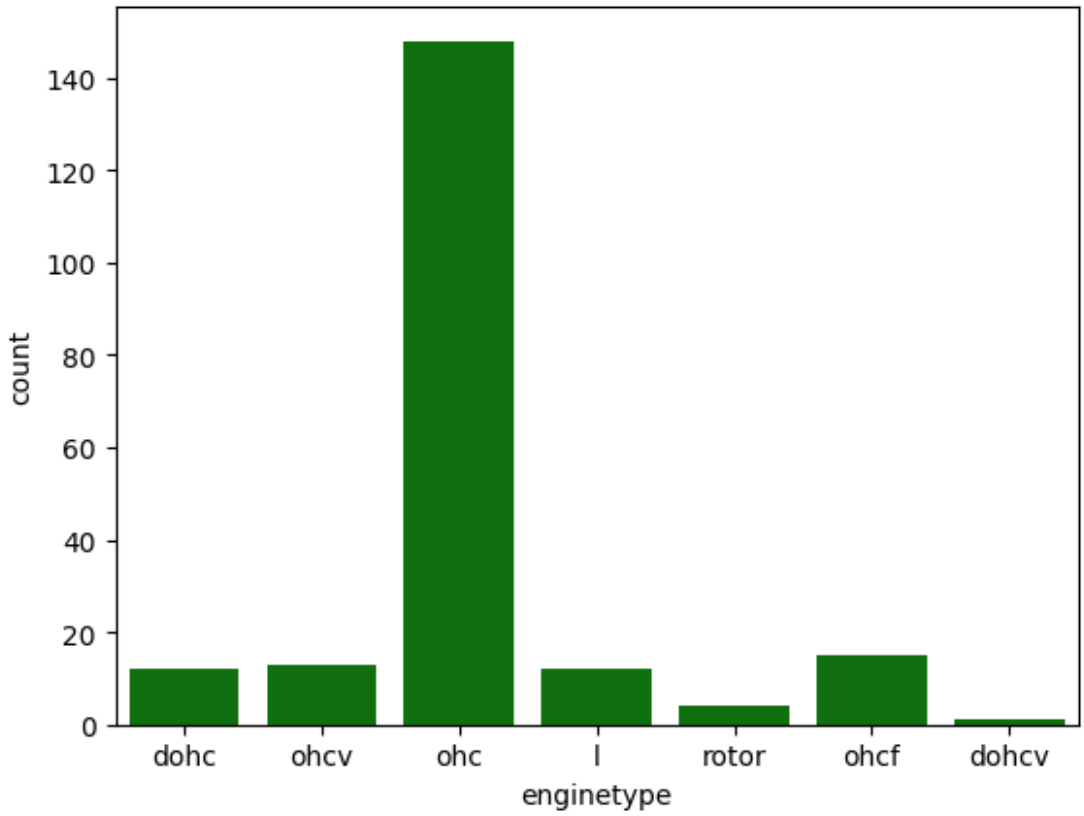



```
df['enginetype'].value_counts()
```

```
enginetype
ohc      148
ohcf      15
ohcv      13
dohc      12
l         12
rotor      4
dohcv      1
Name: count, dtype: int64
```

```
sns.countplot(x=df['enginetype'],data=df,color='green')
```

```
<Axes: xlabel='enginetype', ylabel='count'>
```

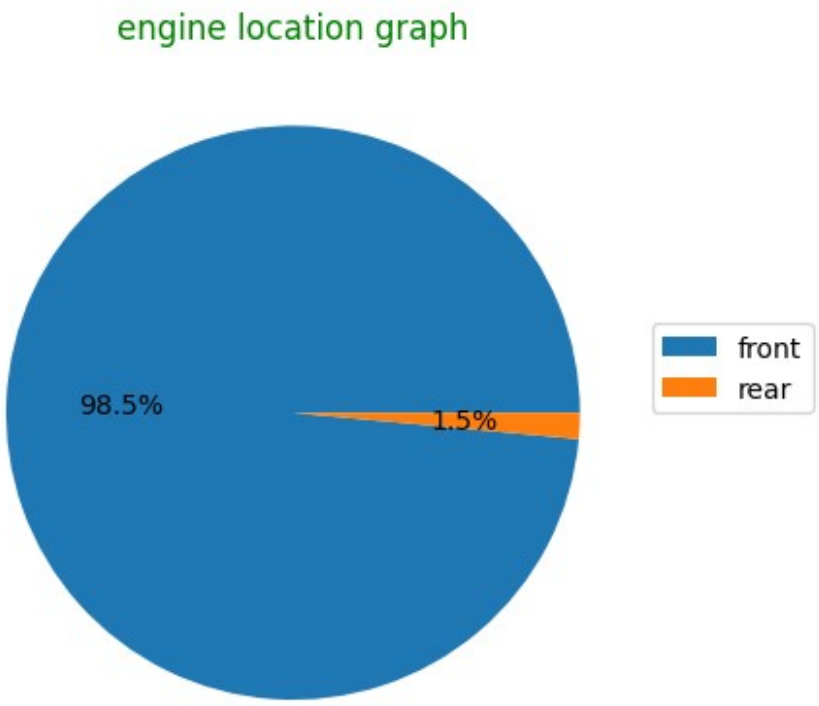



```
df['enginelocation'].value_counts()
```

```
enginelocation
front    202
rear       3
Name: count, dtype: int64
```

```
plt.pie(df['enginelocation'].value_counts(),autopct='%1.1f%%')
plt.legend(df['enginelocation'].value_counts().index,loc=(1,0.5))
plt.title('engine location graph',color='green')
```

```
Text(0.5, 1.0, 'engine location graph')
```

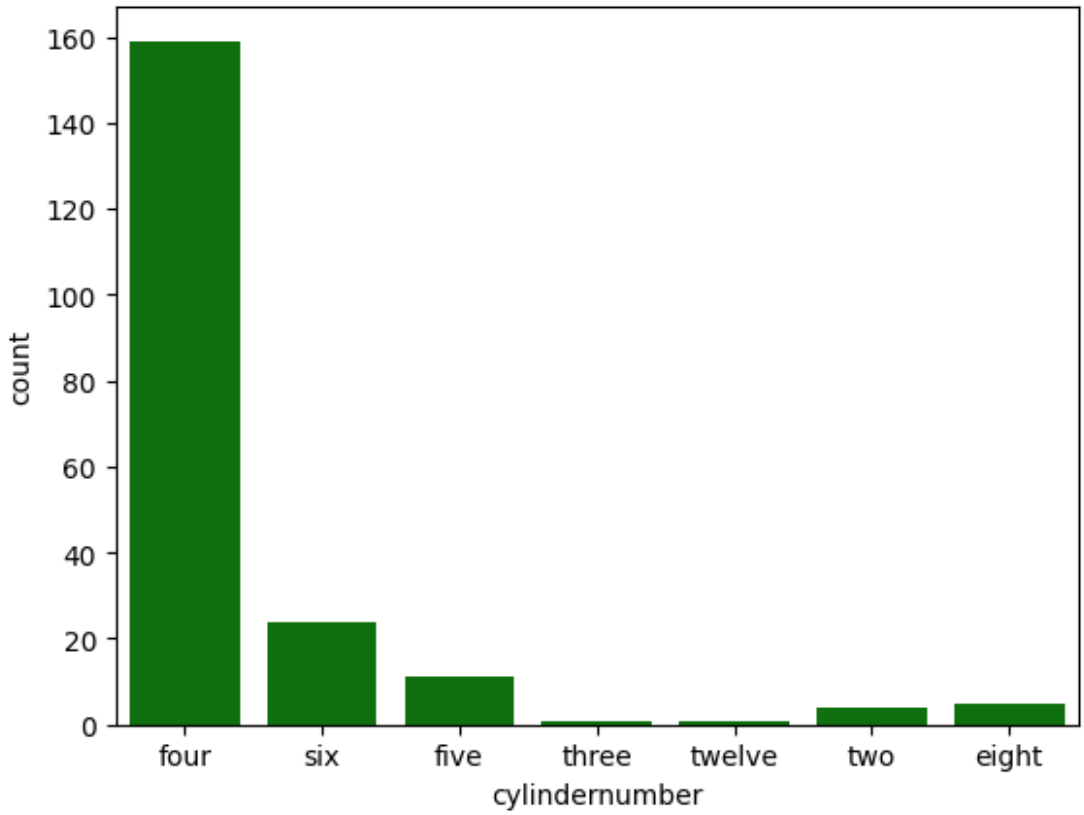



```
df['cylindernumber'].value_counts()
```

```
cylindernumber
four      159
six        24
five       11
eight       5
two         4
three       1
twelve      1
Name: count, dtype: int64
```

```
sns.countplot(x=df['cylindernumber'],data=df,color='green')
```

```
<Axes: xlabel='cylindernumber', ylabel='count'>
```

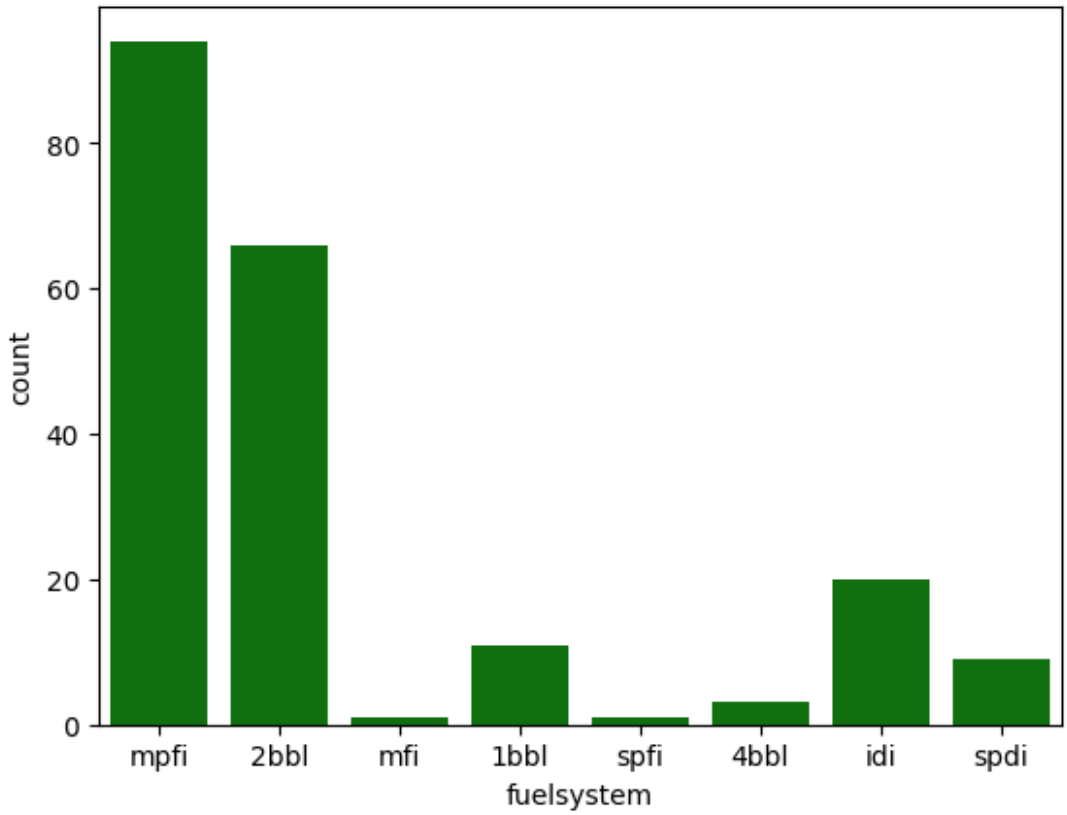



```
df['fuelsystem'].value_counts()
```

```
fuelsystem
mpfi    94
2bbl    66
idi     20
1bbl    11
spdi     9
4bbl     3
mfi      1
spfi     1
Name: count, dtype: int64
```

```
sns.countplot(x=df['fuelsystem'],data=df,color='green')
```

```
<Axes: xlabel='fuelsystem', ylabel='count'>
```



ENCODING

```
#Label encoding
lab=LabelEncoder()
lst=['fueltype','aspiration','doornumber','enginelocation']

for i in lst:
    if df[i].dtype=='object':
        df[i]=lab.fit_transform(df[i])

#getdummies
df1=pd.get_dummies(df[['carbody','cylindernumber','drivewheel','engine
type','fuelsystem']],drop_first=True)
df1=df1.astype(int)
df1
```

	carbody_hardtop	carbody_hatchback	carbody_sedan	carbody_wagon
0	0	0	0	0
1	0	0	0	0
2	0	1	0	0
3	0	0	1	0

```
4                    0                    0              1               0

..                 ...                  ...            ...             ...

200                  0                    0              1               0

201                  0                    0              1               0

202                  0                    0              1               0

203                  0                    0              1               0

204                  0                    0              1               0


     cylindernumber_five  cylindernumber_four  cylindernumber_six  \
0                      0                    1                   0
1                      0                    1                   0
2                      0                    0                   1
3                      0                    1                   0
4                      1                    0                   0
..                   ...                  ...                 ...
200                    0                    1                   0
201                    0                    1                   0
202                    0                    0                   1
203                    0                    0                   1
204                    0                    1                   0

     cylindernumber_three  cylindernumber_twelve
cylindernumber_two  ...  \
0                       0                      0
0  ...
1                       0                      0
0  ...
2                       0                      0
0  ...
3                       0                      0
0  ...
4                       0                      0
0  ...
..                    ...                    ...                   ...
...
200                     0                      0
0  ...
201                     0                      0
0  ...
202                     0                      0
0  ...
203                     0                      0
```

```
0  ...
204                    0                     0
0  ...

     enginetype_ohcf  enginetype_ohcv  enginetype_rotor
fuelsystem_2bbl  \
0                  0                0                 0
0
1                  0                0                 0
0
2                  0                1                 0
0
3                  0                0                 0
0
4                  0                0                 0
0
..                ...              ...               ...                .
..
200                0                0                 0
0
201                0                0                 0
0
202                0                1                 0
0
203                0                0                 0
0
204                0                0                 0
0

     fuelsystem_4bbl  fuelsystem_idi  fuelsystem_mfi  fuelsystem_mpfi
\
0                  0               0               0                1

1                  0               0               0                1

2                  0               0               0                1

3                  0               0               0                1

4                  0               0               0                1

..                ...             ...             ...              ...

200                0               0               0                1

201                0               0               0                1

202                0               0               0                1

203                0               1               0                0
```

```
204                0               0               0                1


     fuelsystem_spdi  fuelsystem_spfi
0                  0                0
1                  0                0
2                  0                0
3                  0                0
4                  0                0
..               ...              ...
200                0                0
201                0                0
202                0                0
203                0                0
204                0                0

[205 rows x 25 columns]
```

```
#concatination
df2=pd.concat([df,df1],axis=1)
df2
```

```
     car_ID  symboling                   CarName  fueltype  aspiration
\
0         1          3        alfa-romero giulia         1           0

1         2          3       alfa-romero stelvio         1           0

2         3          1  alfa-romero Quadrifoglio         1           0

3         4          2               audi 100 ls         1           0

4         5          2                audi 100ls         1           0

..      ...        ...                       ...       ...         ...

200     201         -1           volvo 145e (sw)         1           0

201     202         -1               volvo 144ea         1           1

202     203         -1               volvo 244dl         1           0

203     204         -1                 volvo 246         0           1

204     205         -1               volvo 264gl         1           1


     doornumber      carbody drivewheel  enginelocation
wheelbase  ...  \
0             1  convertible        rwd               0
```

```
88.6  ...
1             1  convertible        rwd               0
88.6  ...
2             1    hatchback        rwd               0
94.5  ...
3             0        sedan        fwd               0
99.8  ...
4             0        sedan        4wd               0
99.4  ...
..          ...          ...        ...             ...         ...  ..
.
200           0        sedan        rwd               0
109.1  ...
201           0        sedan        rwd               0
109.1  ...
202           0        sedan        rwd               0
109.1  ...
203           0        sedan        rwd               0
109.1  ...
204           0        sedan        rwd               0
109.1  ...

     enginetype_ohcf  enginetype_ohcv  enginetype_rotor
fuelsystem_2bbl  \
0                  0                0                 0
0
1                  0                0                 0
0
2                  0                1                 0
0
3                  0                0                 0
0
4                  0                0                 0
0
..               ...              ...               ...                .
..
200                0                0                 0
0
201                0                0                 0
0
202                0                1                 0
0
203                0                0                 0
0
204                0                0                 0
0

    fuelsystem_4bbl fuelsystem_idi  fuelsystem_mfi fuelsystem_mpfi  \
0                 0              0                0                1
```

```
1                    0                0                 0                 1
2                    0                0                 0                 1
3                    0                0                 0                 1
4                    0                0                 0                 1
..                 ...              ...               ...               ...
200                  0                0                 0                 1
201                  0                0                 0                 1
202                  0                0                 0                 1
203                  0                1                 0                 0
204                  0                0                 0                 1
```

```
     fuelsystem_spdi  fuelsystem_spfi
0                  0                0
1                  0                0
2                  0                0
3                  0                0
4                  0                0
..               ...              ...
200                0                0
201                0                0
202                0                0
203                0                0
204                0                0
```

```
[205 rows x 51 columns]
```

```
#dropping unwanted columns

df2.drop(['carbody','cylindernumber','drivewheel','enginetype','fuelsy
stem','car_ID','CarName'],axis=1,inplace=True)
df2.dtypes
```

```
symboling                  int64
fueltype                   int64
aspiration                 int64
doornumber                 int64
enginelocation             int64
wheelbase                float64
carlength                float64
carwidth                 float64
carheight                float64
curbweight                 int64
enginesize                 int64
boreratio                float64
stroke                   float64
compressionratio         float64
horsepower                 int64
peakrpm                    int64
citympg                    int64
highwaympg                 int64
```

```
price                     float64
carbody_hardtop             int64
carbody_hatchback           int64
carbody_sedan               int64
carbody_wagon               int64
cylindernumber_five         int64
cylindernumber_four         int64
cylindernumber_six          int64
cylindernumber_three        int64
cylindernumber_twelve       int64
cylindernumber_two          int64
drivewheel_fwd              int64
drivewheel_rwd              int64
enginetype_dohcv            int64
enginetype_l                int64
enginetype_ohc              int64
enginetype_ohcf             int64
enginetype_ohcv             int64
enginetype_rotor            int64
fuelsystem_2bbl             int64
fuelsystem_4bbl             int64
fuelsystem_idi              int64
fuelsystem_mfi              int64
fuelsystem_mpfi             int64
fuelsystem_spdi             int64
fuelsystem_spfi             int64
dtype: object
```

SEPERATING X AND Y

```
#x as input variable
x=df2.drop('price',axis=True)
x
```

```
     symboling  fueltype  aspiration  doornumber  enginelocation
wheelbase  \
0            3         1           0           1               0
88.6
1            3         1           0           1               0
88.6
2            1         1           0           1               0
94.5
3            2         1           0           0               0
99.8
4            2         1           0           0               0
99.4
..         ...       ...         ...         ...             ...
...
200         -1         1           0           0               0
```

```
109.1
201         -1         1           1           0                0
109.1
202         -1         1           0           0                0
109.1
203         -1         0           1           0                0
109.1
204         -1         1           1           0                0
109.1

     carlength  carwidth  carheight  curbweight  ...  enginetype_ohcf
\
0        168.8      64.1       48.8        2548  ...                0

1        168.8      64.1       48.8        2548  ...                0

2        171.2      65.5       52.4        2823  ...                0

3        176.6      66.2       54.3        2337  ...                0

4        176.6      66.4       54.3        2824  ...                0

..         ...       ...        ...         ...  ...              ...

200      188.8      68.9       55.5        2952  ...                0

201      188.8      68.8       55.5        3049  ...                0

202      188.8      68.9       55.5        3012  ...                0

203      188.8      68.9       55.5        3217  ...                0

204      188.8      68.9       55.5        3062  ...                0


     enginetype_ohcv  enginetype_rotor  fuelsystem_2bbl
fuelsystem_4bbl  \
0                  0                 0                0
0
1                  0                 0                0
0
2                  1                 0                0
0
3                  0                 0                0
0
4                  0                 0                0
0
..               ...               ...              ...               .
..
200                0                 0                0
```

```
0
201                 0                 0                 0
0
202                 1                 0                 0
0
203                 0                 0                 0
0
204                 0                 0                 0
0

     fuelsystem_idi  fuelsystem_mfi  fuelsystem_mpfi  fuelsystem_spdi
\
0                 0               0                1                 0

1                 0               0                1                 0

2                 0               0                1                 0

3                 0               0                1                 0

4                 0               0                1                 0

..              ...             ...              ...               ...

200               0               0                1                 0

201               0               0                1                 0

202               0               0                1                 0

203               1               0                0                 0

204               0               0                1                 0


     fuelsystem_spfi
0                  0
1                  0
2                  0
3                  0
4                  0
..               ...
200                0
201                0
202                0
203                0
204                0

[205 rows x 43 columns]
```

```
y=df2['price']
y
```

```
0      13495.0
1      16500.0
2      16500.0
3      13950.0
4      17450.0
        ...
200    16845.0
201    19045.0
202    21485.0
203    22470.0
204    22625.0
Name: price, Length: 205, dtype: float64
```

```
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=.30,rando
m_state=42)
x_train
```

```
     symboling  fueltype  aspiration  doornumber  enginelocation
wheelbase  \
177         -1         1           0           0               0
102.4
75           1         1           1           1               0
102.7
174         -1         0           1           0               0
102.4
31           2         1           0           1               0
86.6
12           0         1           0           1               0
101.2
..         ...       ...         ...         ...             ...
...
106          1         1           0           1               0
99.2
14           1         1           0           0               0
103.5
92           1         1           0           0               0
94.5
179          3         1           0           1               0
102.9
102          0         1           0           0               0
100.4

     carlength  carwidth  carheight  curbweight  ...  enginetype_ohcf
\
177      175.6      66.5       53.9        2458  ...                0

75       178.4      68.0       54.8        2910  ...                0
```

```
174      175.6      66.5       54.9        2480  ...                 0
31       144.6      63.9       50.8        1819  ...                 0
12       176.8      64.8       54.3        2710  ...                 0
..         ...       ...        ...         ...  ...               ...
106      178.5      67.9       49.7        3139  ...                 0
14       189.0      66.9       55.7        3055  ...                 0
92       165.3      63.8       54.5        1938  ...                 0
179      183.5      67.7       52.0        3016  ...                 0
102      184.6      66.5       56.1        3296  ...                 0

     enginetype_ohcv  enginetype_rotor  fuelsystem_2bbl
fuelsystem_4bbl  \
177                0                 0                0
0
75                 0                 0                0
0
174                0                 0                0
0
31                 0                 0                0
0
12                 0                 0                0
0
..               ...               ...              ...               .
..
106                1                 0                0
0
14                 0                 0                0
0
92                 0                 0                1
0
179                0                 0                0
0
102                1                 0                0
0

     fuelsystem_idi  fuelsystem_mfi  fuelsystem_mpfi  fuelsystem_spdi
\
177               0               0                1                 0
75                0               0                1                 0
```

```
174                1                0                 0                 0

31                 0                0                 0                 0

12                 0                0                 1                 0

..               ...              ...               ...               ...

106                0                0                 1                 0

14                 0                0                 1                 0

92                 0                0                 0                 0

179                0                0                 1                 0

102                0                0                 1                 0


     fuelsystem_spfi
177                0
75                 0
174                0
31                 0
12                 0
..               ...
106                0
14                 0
92                 0
179                0
102                0

[143 rows x 43 columns]

x_test

     symboling  fueltype  aspiration  doornumber  enginelocation
wheelbase  \
15           0         1           0           0               0
103.5
9            0         1           1           1               0
99.5
100          0         1           0           0               0
97.2
132          3         1           0           1               0
99.1
68          -1         0           1           0               0
110.0
..         ...       ...         ...         ...             ...
...
56           3         1           0           1               0
```

```
95.3
128          3         1           0           1                1
89.5
76           2         1           0           1                0
93.7
144          0         1           0           0                0
97.0
104          3         1           0           1                0
91.3

     carlength  carwidth  carheight  curbweight  ...  enginetype_ohcf
\
15       189.0      66.9       55.7        3230  ...                0

9        178.2      67.9       52.0        3053  ...                0

100      173.4      65.2       54.7        2302  ...                0

132      186.6      66.5       56.1        2658  ...                0

68       190.9      70.3       58.7        3750  ...                0

..         ...       ...        ...         ...  ...              ...

56       169.0      65.7       49.6        2380  ...                0

128      168.9      65.0       51.6        2800  ...                1

76       157.3      64.4       50.8        1918  ...                0

144      172.0      65.4       54.3        2385  ...                1

104      170.7      67.9       49.7        3071  ...                0


     enginetype_ohcv  enginetype_rotor  fuelsystem_2bbl
fuelsystem_4bbl  \
15                 0                 0                0
0
9                  0                 0                0
0
100                0                 0                1
0
132                0                 0                0
0
68                 0                 0                0
0
..               ...               ...              ...               .
..
56                 0                 1                0
```

```
1
128                 0                 0                 0
0
76                  0                 0                 1
0
144                 0                 0                 1
0
104                 1                 0                 0
0

     fuelsystem_idi  fuelsystem_mfi  fuelsystem_mpfi  fuelsystem_spdi
\
15                0               0                1                 0

9                 0               0                1                 0

100               0               0                0                 0

132               0               0                1                 0

68                1               0                0                 0

..              ...             ...              ...               ...

56                0               0                0                 0

128               0               0                1                 0

76                0               0                0                 0

144               0               0                0                 0

104               0               0                1                 0


     fuelsystem_spfi
15                 0
9                  0
100                0
132                0
68                 0
..               ...
56                 0
128                0
76                 0
144                0
104                0

[62 rows x 43 columns]

y_train
```

```
177    11248.0
75     16503.0
174    10698.0
31      6855.0
12     20970.0
        ...
106    18399.0
14     24565.0
92      6849.0
179    15998.0
102    14399.0
Name: price, Length: 143, dtype: float64
```

```
y_test
```

```
15     30760.000
9      17859.167
100     9549.000
132    11850.000
68     28248.000
         ...
56     11845.000
128    37028.000
76      5389.000
144     9233.000
104    17199.000
Name: price, Length: 62, dtype: float64
```

MODEL CREATION

```
model=LinearRegression()
model.fit(x_train,y_train)
```

```
LinearRegression()
```

```
y_pred=model.predict(x_test)
y_pred
```

```
array([28789.49001435, 20620.63614303, 10439.81708869, 13080.97596562,
       26508.2560389 ,  5652.87320458,  7404.34732707,  7890.50218351,
        8438.20240933,  8216.04952813, 17334.1081073 ,  7184.10590596,
       16666.77788623,  8893.95047362, 43439.33332466,  6208.90429031,
        4343.7299397 , 13909.3648381 , 10627.96608776,  9946.2926437 ,
       11147.03041795, 17219.97172739,  6768.53318996,  2729.25616142,
        7122.39123972, 29343.08293322, 13780.99757454, 16430.89280338,
        4480.75941091, 17718.51563485, 27328.21316198,  6159.78288962,
        6296.97996495, 20020.84431001,  7166.41970743, 27042.81604006,
       12530.32557035, 13626.0244425 ,  6590.98812919, 14245.2197143 ,
        6490.90029973, 12925.43351039, 17683.59601539,  5755.82063462,
        6581.46477642,  9223.09768198,  6159.78288962,  6036.7981726 ,
```

```
       16875.9076384 , 15768.03687359,  5503.07995485, 20543.75731459,
        6077.39489533,  9443.66303585,  4431.42296141, 16396.17011025,
       13796.17802054, 13626.0244425 , 35197.27571501,  5962.1148521 ,
        9325.34969991, 17429.3797627 ])
```

```
df3=pd.DataFrame({"Actual_value":y_test,"pedicted_value":y_pred,"diffa
rance":y_test-y_pred})
df3
```

```
     Actual_value  pedicted_value   diffarance
15      30760.000    28789.490014  1970.509986
9       17859.167    20620.636143 -2761.469143
100      9549.000    10439.817089  -890.817089
132     11850.000    13080.975966 -1230.975966
68      28248.000    26508.256039  1739.743961
..            ...             ...         ...
56      11845.000    13626.024442 -1781.024442
128     37028.000    35197.275715  1830.724285
76       5389.000     5962.114852  -573.114852
144      9233.000     9325.349700   -92.349700
104     17199.000    17429.379763  -230.379763

[62 rows x 3 columns]
```

PERFORMANCE EVALUATION

```
print("MAE is:",mean_absolute_error(y_test,y_pred))
```

```
MAE is: 1889.8051330426135
```

```
print("mean_absolute_percentage_error
is:",mean_absolute_percentage_error(y_test,y_pred))
```

```
mean_absolute_percentage_error is: 0.16075239872131536
```

```
print("MSE is:",mean_squared_error(y_test,y_pred))
```

```
MSE is: 7052032.685191335
```

```
print("r2_score is:",r2_score(y_test,y_pred))
```

```
r2_score is: 0.8982161227892793
```