

C4_S4_Challenge

In [1]:

```
#Import the required library
import numpy as np
import pandas as pd
import warnings
warnings.filterwarnings('ignore')
```

In [2]:

```
DF = pd.read_csv('E:\Aishwarya official\Aishwarya Data Scince\Course 4\DS1_C4_S4_Car_Prices_Data_Challenge.csv')
DF
```

Out[2]:

	year	make	model	trim	body	transmission	vin	state	condition	odometer	color	interior	seller	mmr	sel
0	2015	Kia	Sorento	LX	SUV	automatic	5xyktca69fg566472	ca	5.0	16639.0	white	black	kia motors america, inc	20500	
1	2015	Kia	Sorento	LX	SUV	automatic	5xyktca69fg561319	ca	5.0	9393.0	white	beige	kia motors america, inc	20800	
2	2014	BMW	3 Series	328i SULEV	Sedan	automatic	wba3c1c51ek116351	ca	4.5	1331.0	gray	black	financial services remarketing (lease)	31900	
3	2015	Volvo	S60	T5	Sedan	automatic	yv16121b4f1310987	ca	4.1	14282.0	white	black	volvo na rep/world omni	27500	
4	2014	BMW	6 Series Gran Coupe	650i	Sedan	automatic	wba6b2c57ed129731	ca	4.3	2641.0	gray	black	financial services remarketing (lease)	66000	
...
558832	2015	Kia	K900	Luxury	Sedan	NaN	knalw4d4xf6019304	in	4.5	18255.0	silver	black	avis corporation	35300	
558833	2012	Ram	2500	Power Wagon	Crew Cab	automatic	3c6td5et6cg112407	wa	5.0	54393.0	white	black	i-5 uhlmann rv	30200	
558834	2012	BMW	X5	xDrive35d	SUV	automatic	5uxzw0c58cl668465	ca	4.8	50561.0	black	black	financial services remarketing (lease)	29800	
558835	2015	Nissan	Altima	2.5 S	sedan	automatic	1n4al3ap0fc216050	ga	3.8	16658.0	white	black	enterprise vehicle exchange / tra / rental / t...	15100	
558836	2014	Ford	F-150	XLT	SuperCrew	automatic	1ftfw1et2eke87277	ca	3.4	15008.0	gray	gray	ford motor credit company,llc pd	29600	

558837 rows × 16 columns

Task 1

In [3]:

```
df = DF[(DF.year == 2014)]
df
```

Out[3]:

	year	make	model	trim	body	transmission	vin	state	condition	odometer	color	interior	seller	mn
2	2014	BMW	3 Series	328i SULEV	Sedan	automatic	wba3c1c51ek116351	ca	4.5	1331.0	gray	black	financial services remarketing (lease)	3190
4	2014	BMW	6 Series Gran Coupe	650i	Sedan	automatic	wba6b2c57ed129731	ca	4.3	2641.0	gray	black	financial services remarketing (lease)	6600
6	2014	BMW	M5	Base	Sedan	automatic	wbsfv9c51ed593089	ca	3.4	14943.0	black	black	the hertz corporation	6900
7	2014	Chevrolet	Cruze	1LT	Sedan	automatic	1g1pc5sb2e7128460	ca	2.0	28617.0	black	black	enterprise vehicle exchange / tra / rental / t...	1190
8	2014	Audi	A4	2.0T Premium Plus quattro	Sedan	automatic	wauffaf13en030343	ca	4.2	9557.0	white	black	audi mission viejo	3210
...
558814	2014	Dodge	Charger	SE	Sedan	NaN	2c3cdxbg3eh324197	va	4.3	20485.0	white	black	hertz corporation/gdp	1630
558820	2014	Dodge	Charger	SE	Sedan	NaN	2c3cdxbg9eh324236	va	4.2	22744.0	white	black	hertz corporation/gdp	1620
558826	2014	Jeep	Grand Cherokee	Limited	SUV	automatic	1c4rjebg4ec573100	ca	4.4	9024.0	gray	black	enterprise vehicle exchange / tra / rental / t...	2980
558827	2014	Jeep	Grand Cherokee	Laredo	SUV	automatic	1c4rjfag0ec466276	pa	4.2	25180.0	gray	black	hertz corporation/gdp	2600
558836	2014	Ford	F-150	XLT	SuperCrew	automatic	1ftfw1et2eke87277	ca	3.4	15008.0	gray	gray	ford motor credit company,llc pd	2960

81070 rows × 16 columns



In [4]:

```
pvt = pd.pivot_table(df, index = ['make'], values = ['sellingprice'], aggfunc= 'mean').sort_values(by=['sellingprice'])
pvt.head()
```

Out[4]:

	sellingprice
make	
smart	8620.000000
FIAT	12585.109290
Mitsubishi	13502.323838
Kia	14341.490037
Volkswagen	14840.196850

In []:

Task 2

In [5]:

```
df1 = DF[(DF.year == 2010) & (DF.condition >= 4.5) & (DF.make == 'BMW')]['sellingprice'].mean()
df1
```

Out[5]:

23267.441860465115

In [6]:

```
dt = DF[(DF.year == 2015) & (DF.condition >= 4.5) & (DF.make == 'BMW')]['sellingprice'].mean()
dt
```

Out[6]:

43096.770601336306

In [7]:

```
percentage = ((dt-df1)*100)/dt
```

In [8]:

```
print("the relative percentage :", )
```

the relative percentage :

Task 3

In [9]:

```
df3 = DF[(DF.interior== 'black' ) ]
df3
```

Out[9]:

	year	make	model	trim	body	transmission	vin	state	condition	odometer	color	interior	seller	mmr	se
0	2015	Kia	Sorento	LX	SUV	automatic	5xyktca69fg566472	ca	5.0	16639.0	white	black	kia motors america, inc	20500	
2	2014	BMW	3 Series	328i SULEV	Sedan	automatic	wba3c1c51ek116351	ca	4.5	1331.0	gray	black	financial services remarketing (lease)	31900	
3	2015	Volvo	S60	T5	Sedan	automatic	yv1612tb4f1310987	ca	4.1	14282.0	white	black	volvo na rep/world omni	27500	
4	2014	BMW	6 Series Gran Coupe	650i	Sedan	automatic	wba6b2c57ed129731	ca	4.3	2641.0	gray	black	financial services remarketing (lease)	66000	
5	2015	Nissan	Altima	2.5 S	Sedan	automatic	1n4al3ap1fn326013	ca	1.0	5554.0	gray	black	enterprise vehicle exchange / tra / rental / t...	15350	
...
558827	2014	Jeep	Grand Cherokee	Laredo	SUV	automatic	1c4rfag0ec466276	pa	4.2	25180.0	gray	black	hertz corporation/gdp	26000	
558832	2015	Kia	K900	Luxury	Sedan	NaN	kna1w4d4xf6019304	in	4.5	18255.0	silver	black	avis corporation	35300	
558833	2012	Ram	2500	Power Wagon	Crew Cab	automatic	3c6td5et6cg112407	wa	5.0	54393.0	white	black	i-5 uhlmann rv	30200	
558834	2012	BMW	X5	xDrive35d	SUV	automatic	5uxzw0c58cl668465	ca	4.8	50561.0	black	black	financial services remarketing (lease)	29800	
558835	2015	Nissan	Altima	2.5 S	sedan	automatic	1n4al3ap0fc216050	ga	3.8	16658.0	white	black	enterprise vehicle exchange / tra / rental / t...	15100	

244347 rows × 16 columns



In [10]:

```
pvt2 = pd.pivot_table(df3,index = ['interior'], values =['mmr'], aggfunc = 'mean')
pvt2
```

Out[10]:

	mmr
interior	
black	15858.520055

In [11]:

```
df4 = DF[(DF.interior== 'gray' ) ]
df4
```

Out[11]:

	year	make	model	trim	body	transmission	vin	state	condition	odometer	color	interior	seller	mmi
25	2015	Hyundai	Sonata	SE	Sedan	automatic	5npe24af4fh038482	ca	NaN	9281.0	silver	gray	enterprise vehicle exchange / tra / rental / t...	151500
35	2014	Buick	Verano	Convenience Group	Sedan	NaN	1g4pr5sk8e4175320	ca	2.0	19531.0	gray	gray	enterprise vehicle exchange / tra / rental / t...	150000
41	2015	Hyundai	Sonata	SE	Sedan	automatic	5npe24af2fh014813	ca	NaN	9208.0	silver	gray	enterprise vehicle exchange / tra / rental / t...	157000
46	2015	Volvo	V60	T5	Wagon	automatic	yv1612sb1f1201503	ca	4.2	12242.0	black	gray	volvo na rep/world omni	312000
55	2015	Kia	Sorento	LX	SUV	automatic	5xyktca63fg570727	ca	4.8	10357.0	silver	gray	kia motors america, inc	207000
...
558821	2012	Ford	Escape	XLT	SUV	automatic	1fmcu9d78ckc84074	fl	3.8	74673.0	white	gray	lehman buick gmc llc	115500
558828	2012	Dodge	Grand Caravan	American Value Package	Minivan	automatic	2c4rdgbg1cr349287	ma	3.7	97036.0	silver	gray	ge fleet services for itself/servicer	83000
558829	2012	Hyundai	Elantra	Limited	Sedan	NaN	5npdh4ae7ch106397	pa	4.0	66720.0	gray	gray	champion mazda	102500
558830	2012	Nissan	Sentra	2.0 SR	Sedan	NaN	3n1ab6ap3cl622485	tn	2.6	35858.0	white	gray	nissan-infinity	99500
558836	2014	Ford	F-150	XLT	SuperCrew	automatic	1ftfw1et2eke87277	ca	3.4	15008.0	gray	gray	ford motor credit company,llc pd	296000

178582 rows × 16 columns



In [12]:

```
pvt3 = pd.pivot_table(df4,index = ['interior'], values =['mmr'], aggfunc = 'mean')
pvt3
```

Out[12]:

	mmr
interior	
gray	11189.776545

In [13]:

```
print("Difference between avg of black and gray :" )
```

Difference between avg of black and gray :

Task 4

In [14]:

```
df4 = DF[(DF.year== 2013 ) | (DF.year == 2015 )]  
df4
```

Out[14]:

	year	make	model	trim	body	transmission	vin	state	condition	odometer	color	interior	seller	mmr
0	2015	Kia	Sorento	LX	SUV	automatic	5xyktca69fg566472	ca	5.0	16639.0	white	black	kia motors america, inc	20500
1	2015	Kia	Sorento	LX	SUV	automatic	5xyktca69fg561319	ca	5.0	9393.0	white	beige	kia motors america, inc	20800
3	2015	Volvo	S60	T5	Sedan	automatic	yv1612tb4f1310987	ca	4.1	14282.0	white	black	volvo na rep/world omni	27500
5	2015	Nissan	Altima	2.5 S	Sedan	automatic	1n4al3ap1fn326013	ca	1.0	5554.0	gray	black	enterprise vehicle exchange / tra / rental / t...	15350
11	2015	Kia	Optima	LX	Sedan	automatic	5xxgm4a73fg353538	ca	4.8	2034.0	red	tan	kia motors finance	15150
...
558816	2013	Mercedes-Benz	G-Class	G63 AMG	suv	automatic	wdcyc7df4dx207385	fl	5.0	26799.0	black	black	fields bmw	104000
558818	2013	Chevrolet	Silverado 1500	LT	crew cab	automatic	3gcpce0xdg244430	tx	4.3	74575.0	black	black	stanley chevrolet buick gmc gatesville	22100
558824	2013	Audi	S5	Premium Plus quattro	convertible	automatic	waucgafh6dn005382	fl	5.0	20158.0	silver	black	prestige audi	43900
558832	2015	Kia	K900	Luxury	Sedan	NaN	kna1w4d4xf6019304	in	4.5	18255.0	silver	black	avis corporation	35300
558835	2015	Nissan	Altima	2.5 S	sedan	automatic	1n4al3ap0fc216050	ga	3.8	16658.0	white	black	enterprise vehicle exchange / tra / rental / t...	15100

107605 rows × 16 columns



In [15]:

```
#pd.crosstab(df.school_setting, df.teaching_method, rownames = ['school_setting'] , colnames = ['teaching_method'])
cross = pd.crosstab(df4.color, df4.year , rownames = ['color'], colnames = ['year'])
cross
```

Out[15]:

year	2013	2015
color		
beige	875	104
black	19519	1974
blue	7297	633
brown	1429	142
burgundy	1262	183
charcoal	62	13
gold	817	78
gray	16312	1430
green	1232	87
lime	7	0
off-white	234	20
orange	247	32
pink	21	2
purple	231	34
red	8068	779
silver	14743	1234
turquoise	22	1
white	19413	2235
yellow	75	29
—	6156	403

Task 5

In [16]:

```
df5 = DF[(DF.body == 'SUV')]  
df5
```

Out[16]:

	year	make	model	trim	body	transmission	vin	state	condition	odometer	color	interior	seller	mmr	sellir
0	2015	Kia	Sorento	LX	SUV	automatic	5xyktca69fg566472	ca	5.0	16639.0	white	black	kia motors america, inc	20500	
1	2015	Kia	Sorento	LX	SUV	automatic	5xyktca69fg561319	ca	5.0	9393.0	white	beige	kia motors america, inc	20800	
13	2015	Kia	Sorento	LX	SUV	automatic	5xyktca66fg561407	ca	5.0	14634.0	silver	black	kia motors america, inc	20600	
17	2014	Audi	Q5	2.0T Premium Plus quattro	SUV	automatic	wa1lfafpxea085074	ca	4.9	7983.0	white	black	audi north scottsdale	37100	
28	2014	BMW	X5	sDrive35i	SUV	automatic	5uxkr2c52e0h33130	ca	NaN	11278.0	gray	black	avis rac/san leandro	50400	
...
558805	2012	Jeep	Grand Cherokee	Laredo	SUV	automatic	1c4rfagxcc128770	tn	3.7	42971.0	silver	black	wholesale inc # 2	21900	
558821	2012	Ford	Escape	XLT	SUV	automatic	1fmcu9d78ckc84074	fl	3.8	74673.0	white	gray	lehman buick gmc llc	11550	
558826	2014	Jeep	Grand Cherokee	Limited	SUV	automatic	1c4rjebg4ec573100	ca	4.4	9024.0	gray	black	enterprise vehicle exchange / tra / rental / t...	29800	
558827	2014	Jeep	Grand Cherokee	Laredo	SUV	automatic	1c4rfag0ec466276	pa	4.2	25180.0	gray	black	hertz corporation/gdp	26000	
558834	2012	BMW	X5	xDrive35d	SUV	automatic	5uxzw0c58cd668465	ca	4.8	50561.0	black	black	financial services remarketing (lease)	29800	

119292 rows × 16 columns



In [17]:

```
Datefri = df5[(df5.saledate == 'Fri Dec 19 2014 09:00:00 GMT-0800 (PST)') | (df5.saledate == 'Thu Jan 15 2015 04:30:00 GMT-0800 (PST)')]
Datefri
```

Out[17]:

	year	make	model	trim	body	transmission	vin	state	condition	odometer	color	interior	seller	mmr
906	2012	BMW	X3	xDrive28i	SUV	automatic	5uxwx5c56d725811	ca	4.2	42148.0	gray	gray	financial services remarketing (lease)	25700
1002	2012	BMW	X6	xDrive50i	SUV	automatic	5uxfg8c57c1590176	ca	1.9	39766.0	black	tan	financial services remarketing (lease)	40100
1420	2012	Land Rover	Range Rover	HSE	SUV	automatic	salme1d45ca360653	ca	3.6	56169.0	black	black	us bank	41900
1448	2011	Land Rover	Range Rover	HSE	SUV	automatic	salmf1d41ba352237	ca	3.2	19925.0	green	tan	jpmorgan chase bank,n.a.	48300
2106	2011	BMW	X5	xDrive35d	SUV	automatic	5uxzw0c55bl661293	ca	3.7	35226.0	black	black	financial services remarketing (lease)	31000
...
344506	2001	Toyota	Highlander	V6	SUV	NaN	jtegf21a810010207	pa	1.9	121190.0	green	beige	nawi leasing inc	3625
441493	1999	Toyota	RAV4	Base	SUV	NaN	jt3hp10v1x7138698	ga	2.0	277819.0	green	gray	purple heart	2025
502846	2000	Oldsmobile	Bravada	Base	SUV	automatic	1ghdt13w5y2279289	ne	2.6	187298.0	green	gray	select remarketing group llc/loan max title	750
517488	1999	Ford	Expedition	XLT	SUV	automatic	1fmpu18l9xla91734	ga	2.0	123040.0	green	tan	titelmax/forest park ga2	1300
547089	1999	Ford	Explorer	XL	SUV	automatic	1fmzu34x5xub83012	ne	1.9	152887.0	green	tan	onemain remarketing services	950

879 rows × 16 columns



In [18]:

```
grpgsale= Datefri.groupby(['saledate'])['sellingprice'].count()
grpgsale
```

Out[18]:

saledate
Fri Dec 19 2014 09:00:00 GMT-0800 (PST) 569
Thu Jan 15 2015 04:30:00 GMT-0800 (PST) 310
Name: sellingprice, dtype: int64

In [19]:

```
print(" Percentage :", (569-310)*100/310 )
```

Percentage : 83.54838709677419

Task 6

In [20]:

```
Data = DF
Data
```

Out[20]:

	year	make	model	trim	body	transmission	vin	state	condition	odometer	color	interior	seller	mmr	sel
0	2015	Kia	Sorento	LX	SUV	automatic	5xyktca69fg566472	ca	5.0	16639.0	white	black	kia motors america, inc	20500	
1	2015	Kia	Sorento	LX	SUV	automatic	5xyktca69fg561319	ca	5.0	9393.0	white	beige	kia motors america, inc	20800	
2	2014	BMW	3 Series	328i SULEV	Sedan	automatic	wba3c1c51ek116351	ca	4.5	1331.0	gray	black	financial services remarketing (lease)	31900	
3	2015	Volvo	S60	T5	Sedan	automatic	yv16121b4f1310987	ca	4.1	14282.0	white	black	volvo na rep/world omni	27500	
4	2014	BMW	6 Series Gran Coupe	650i	Sedan	automatic	wba6b2c57ed129731	ca	4.3	2641.0	gray	black	financial services remarketing (lease)	66000	
...
558832	2015	Kia	K900	Luxury	Sedan	NaN	knalw4d4xf6019304	in	4.5	18255.0	silver	black	avis corporation	35300	
558833	2012	Ram	2500	Power Wagon	Crew Cab	automatic	3c6td5et6cg112407	wa	5.0	54393.0	white	black	i-5 uhlmann rv	30200	
558834	2012	BMW	X5	xDrive35d	SUV	automatic	5uxzw0c58cd668465	ca	4.8	50561.0	black	black	financial services remarketing (lease)	29800	
558835	2015	Nissan	Altima	2.5 S	sedan	automatic	1n4al3ap0fc216050	ga	3.8	16658.0	white	black	enterprise vehicle exchange / tra / rental / t...	15100	
558836	2014	Ford	F-150	XLT	SuperCrew	automatic	1ftfw1et2eke87277	ca	3.4	15008.0	gray	gray	ford motor credit company,llc pd	29600	

558837 rows × 16 columns



In [21]:

```
Data.insert(15, 'Discount price', np.nan)
Data
```

Out[21]:

	year	make	model	trim	body	transmission	vin	state	condition	odometer	color	interior	seller	mmr	sel
0	2015	Kia	Sorento	LX	SUV	automatic	5xyktca69fg566472	ca	5.0	16639.0	white	black	kia motors america, inc	20500	
1	2015	Kia	Sorento	LX	SUV	automatic	5xyktca69fg561319	ca	5.0	9393.0	white	beige	kia motors america, inc	20800	
2	2014	BMW	3 Series	328i SULEV	Sedan	automatic	wba3c1c51ek116351	ca	4.5	1331.0	gray	black	financial services remarketing (lease)	31900	
3	2015	Volvo	S60	T5	Sedan	automatic	yv1612tb4f1310987	ca	4.1	14282.0	white	black	volvo na rep/world omni	27500	
4	2014	BMW	6 Series Gran Coupe	650i	Sedan	automatic	wba6b2c57ed129731	ca	4.3	2641.0	gray	black	financial services remarketing (lease)	66000	
...
558832	2015	Kia	K900	Luxury	Sedan	NaN	knalw4d4xf6019304	in	4.5	18255.0	silver	black	avis corporation	35300	
558833	2012	Ram	2500	Power Wagon	Crew Cab	automatic	3c6td5et6cg112407	wa	5.0	54393.0	white	black	i-5 uhlmann rv	30200	
558834	2012	BMW	X5	xDrive35d	SUV	automatic	5uxzw0c58cl668465	ca	4.8	50561.0	black	black	financial services remarketing (lease)	29800	
558835	2015	Nissan	Altima	2.5 S	sedan	automatic	1n4a13ap0fc216050	ga	3.8	16658.0	white	black	enterprise vehicle exchange / tra / rental / t...	15100	
558836	2014	Ford	F-150	XLT	SuperCrew	automatic	1ftfw1et2eke87277	ca	3.4	15008.0	gray	gray	ford motor credit company,llc pd	29600	

558837 rows × 17 columns



In [22]:

```
df6 = Data[(Data.make == 'Ford')|(Data.make == 'Chevrolet')]  
df6
```

Out[22]:

	year	make	model	trim	body	transmission	vin	state	condition	odometer	color	interior	seller	mmr	sellir
7	2014	Chevrolet	Cruze	1LT	Sedan	automatic	1g1pc5sb2e7128460	ca	2.0	28617.0	black	black	enterprise vehicle exchange / tra / rental / t...	11900	
9	2014	Chevrolet	Camaro	LT	Convertible	automatic	2g1fb3d37e9218789	ca	3.0	4809.0	red	black	d/m auto sales inc	26300	
12	2015	Ford	Fusion	SE	Sedan	automatic	3fa6p0hdxfr145753	ca	2.0	5559.0	white	beige	enterprise vehicle exchange / tra / rental / t...	15350	
14	2014	Chevrolet	Cruze	2LT	Sedan	automatic	1g1pe5sbxe7120097	ca	NaN	15686.0	blue	black	avis rac/san leandro	13900	
18	2014	Chevrolet	Camaro	LS	Coupe	automatic	2g1fa1e39e9134494	ca	1.7	13441.0	black	black	wells fargo dealer services	17750	
...
558817	2012	Ford	Flex	SEL	Wagon	automatic	2fmhk6cc1cbd17905	ny	3.9	28320.0	red	black	ford motor credit company,llc	21500	
558818	2013	Chevrolet	Silverado 1500	LT	crew cab	automatic	3gcpce0xdg244430	tx	4.3	74575.0	black	black	stanley chevrolet buick gmc gatesville	22100	
558821	2012	Ford	Escape	XLT	SUV	automatic	1fmcu9d78ckc84074	fl	3.8	74673.0	white	gray	lehman buick gmc llc	11550	
558823	2012	Chevrolet	Silverado 1500	LT	Crew Cab	automatic	3gcpce00cg289987	tx	3.7	37908.0	white	black	wells fargo dealer services	25000	
558836	2014	Ford	F-150	XLT	SuperCrew	automatic	1ftfw1et2eke87277	ca	3.4	15008.0	gray	gray	ford motor credit company,llc pd	29600	

153751 rows × 17 columns



In [23]:

```
Data.loc[(Data['make'] == 'Ford') | (Data['make']=='Chevrolet'), 'Discount price'] = Data['sellingprice']*0.9  
Data.loc[(Data['make'] != 'Ford') | (Data['make']!='Chevrolet'), 'Discount price'] = Data['sellingprice']*0.8
```

In [24]:

Data

Out[24]:

	year	make	model	trim	body	transmission	vin	state	condition	odometer	color	interior	seller	mmr	sel
0	2015	Kia	Sorento	LX	SUV	automatic	5xyktca69fg566472	ca	5.0	16639.0	white	black	kia motors america, inc	20500	
1	2015	Kia	Sorento	LX	SUV	automatic	5xyktca69fg561319	ca	5.0	9393.0	white	beige	kia motors america, inc	20800	
2	2014	BMW	3 Series	328i SULEV	Sedan	automatic	wba3c1c51ek116351	ca	4.5	1331.0	gray	black	financial services remarketing (lease)	31900	
3	2015	Volvo	S60	T5	Sedan	automatic	yv1612tb4f1310987	ca	4.1	14282.0	white	black	volvo na rep/world omni	27500	
4	2014	BMW	6 Series Gran Coupe	650i	Sedan	automatic	wba6b2c57ed129731	ca	4.3	2641.0	gray	black	financial services remarketing (lease)	66000	
...
558832	2015	Kia	K900	Luxury	Sedan	NaN	knalw4d4xf6019304	in	4.5	18255.0	silver	black	avis corporation	35300	
558833	2012	Ram	2500	Power Wagon	Crew Cab	automatic	3c6td5et6cg112407	wa	5.0	54393.0	white	black	i-5 uhlmann rv	30200	
558834	2012	BMW	X5	xDrive35d	SUV	automatic	5uxzw0c58cd668465	ca	4.8	50561.0	black	black	financial services remarketing (lease)	29800	
558835	2015	Nissan	Altima	2.5 S	sedan	automatic	1n4al3ap0fc216050	ga	3.8	16658.0	white	black	enterprise vehicle exchange / tra / rental / t...	15100	
558836	2014	Ford	F-150	XLT	SuperCrew	automatic	1ftfw1et2eke87277	ca	3.4	15008.0	gray	gray	ford motor credit company,llc pd	29600	

558837 rows × 18 columns



Task 7

In [25]:

```
data1 = DF
data1= data1.drop(['vin', 'saledate'], axis=1)
data1
```

Out[25]:

	year	make	model	trim	body	transmission	state	condition	odometer	color	interior	seller	mmr	sellingprice	Discount price	D
0	2015	Kia	Sorento	LX	SUV	automatic	ca	5.0	16639.0	white	black	kia motors america, inc	20500	21500	NaN	
1	2015	Kia	Sorento	LX	SUV	automatic	ca	5.0	9393.0	white	beige	kia motors america, inc	20800	21500	NaN	
2	2014	BMW	3 Series	328i SULEV	Sedan	automatic	ca	4.5	1331.0	gray	black	financial services remarketing (lease)	31900	30000	NaN	
3	2015	Volvo	S60	T5	Sedan	automatic	ca	4.1	14282.0	white	black	volvo na rep/world omni	27500	27750	NaN	
4	2014	BMW	6 Series Gran Coupe	650i	Sedan	automatic	ca	4.3	2641.0	gray	black	financial services remarketing (lease)	66000	67000	NaN	
...	
558832	2015	Kia	K900	Luxury	Sedan	NaN	in	4.5	18255.0	silver	black	avis corporation	35300	33000	NaN	
558833	2012	Ram	2500	Power Wagon	Crew Cab	automatic	wa	5.0	54393.0	white	black	i-5 uhlmann rv	30200	30800	NaN	
558834	2012	BMW	X5	xDrive35d	SUV	automatic	ca	4.8	50561.0	black	black	financial services remarketing (lease)	29800	34000	NaN	
558835	2015	Nissan	Altima	2.5 S	sedan	automatic	ga	3.8	16658.0	white	black	enterprise vehicle exchange / tra / rental / t...	15100	11100	NaN	
558836	2014	Ford	F-150	XLT	SuperCrew	automatic	ca	3.4	15008.0	gray	gray	ford motor credit company, llc pd	29600	26700	NaN	

558837 rows × 16 columns

In [26]:

```
data1.isnull().sum()
```

Out[26]:

```
year          0
make         10301
model        10399
trim         10651
body         13195
transmission  65353
state         1
condition    11794
odometer      94
color         749
interior      749
seller        0
mmr           0
sellingprice  0
Discount price 558837
Discount price 0
dtype: int64
```

In [27]:

```
data1['make'].value_counts()
```

Out[27]:

```
Ford          93554
Chevrolet     60197
Nissan         53946
Toyota        39871
Dodge         30710
...
airstream      1
dot            1
hyundai tk     1
mazda tk       1
Lotus          1
Name: make, Length: 96, dtype: int64
```

In [28]:

```
data1['make'] = data1['make'].fillna('Ford')
```

In [29]:

```
data1['model'].value_counts()
```

Out[29]:

```
Altima        19349
F-150         14479
Fusion        12946
Camry         12545
Escape        11861
...
siera         1
avalon        1
c240s         1
allure        1
458 Italia    1
Name: model, Length: 973, dtype: int64
```

In [30]:

```
data1['model'] = data1['model'].fillna('Altima')
```

In [31]:

```
data1['trim'].value_counts()
data1['model'] = data1['model'].fillna('Altima')
data1['trim'] = data1['trim'].fillna('Base')
```

In [32]:

```
data1['body'].value_counts()
data1['body'] = data1['body'].fillna('Sedan')
```

In [33]:

```
data1['transmission'].value_counts()
data1['transmission'] = data1['transmission'].fillna('automatic')
```

In [34]:

```
data1['state'].value_counts()
data1['state'] = data1['state'].fillna('fl')
```

In [35]:

```
data1['color'].value_counts()
data1['color'] = data1['color'].fillna('black')
```

In [36]:

```
data1['interior'].value_counts()
data1['interior'] = data1['body'].fillna('Sedan')
```

In [37]:

```
#df['pretest'] = df['pretest'].fillna(df['pretest'].mean())  
data1['condition']=data1['condition'].fillna(data1['condition'].mean())
```

In [38]:

```
data1['odometer']=data1['odometer'].fillna(data1['odometer'].mean())
```

In [39]:

```
data1.isnull().sum()
```

Out[39]:

```
year          0  
make          0  
model         0  
trim          0  
body          0  
transmission  0  
state         0  
condition     0  
odometer      0  
color         0  
interior      0  
seller        0  
mmr           0  
sellingprice  0  
Discount price 558837  
Discount price 0  
dtype: int64
```

In []: