```
import numpy as np
import matplotlib.pyplot as plt
import pandas as pd
import seaborn as sna
```

```
dataset = pd.read_csv('ford.csv')
dataset.head()
```

	model	year	price	transmission	mileage	fuelType	tax	mpg	engineSize
0	Fiesta	2017	12000	Automatic	15944	Petrol	150	57.7	1.0
1	Focus	2018	14000	Manual	9083	Petrol	150	57.7	1.0
2	Focus	2017	13000	Manual	12456	Petrol	150	57.7	1.0
3	Fiesta	2019	17500	Manual	10460	Petrol	145	40.3	1.5

```
dataset.tail()
```

	model	year	price	transmission	mileage	fuelType	tax	mpg	engineS
17960	Fiesta	2016	7999	Manual	31348	Petrol	125	54.3	
17961	B-MAX	2017	8999	Manual	16700	Petrol	150	47.1	
17962	B-MAX	2014	7499	Manual	40700	Petrol	30	57.7	

```
dataset.shape
```

```
(17965, 9)
```

```
dataset.columns
```

```
Index(['model', 'year', 'price', 'transmission', 'mileage', 'fuelType', 'tax',
       'mpg', 'engineSize'],
      dtype='object')
```

```
dataset.describe()
```

	year	price	mileage	tax	mpg	1
count	17965.000000	17965.000000	17965.000000	17965.000000	17965.000000	
mean	2016.866574	12279.756415	23363.630504	113.334539	57.906991	
std	2.050346	4741.382606	19472.114690	62.010438	10.125977	
min	1996.000000	495.000000	1.000000	0.000000	20.800000	
25%	2016.000000	8999.000000	9987.000000	30.000000	52.300000	
50%	2017.000000	11291.000000	18243.000000	145.000000	58.900000	
75%	2018.000000	15299.000000	31064.000000	145.000000	65.700000	

```
dataset.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 17965 entries, 0 to 17964
Data columns (total 9 columns):
 #   Column        Non-Null Count  Dtype
---  ------        --------------  -----
 0   model         17965 non-null  object
 1   year          17965 non-null  int64
 2   price         17965 non-null  int64
 3   transmission  17965 non-null  object
 4   mileage       17965 non-null  int64
 5   fuelType      17965 non-null  object
```

```
 6   tax           17965 non-null  int64
 7   mpg           17965 non-null  float64
 8   engineSize    17965 non-null  float64
dtypes: float64(2), int64(4), object(3)
memory usage: 1.2+ MB
```

```
dataset.rename(index = str, columns = {'model' : 'Model', 'year' : 'Year'},inplace = True)
```

```
dataset.head()
```

	Model	Year	price	transmission	mileage	fuelType	tax	mpg	engineSize
0	Fiesta	2017	12000	Automatic	15944	Petrol	150	57.7	1.0
1	Focus	2018	14000	Manual	9083	Petrol	150	57.7	1.0
2	Focus	2017	13000	Manual	12456	Petrol	150	57.7	1.0
3	Fiesta	2019	17500	Manual	10460	Petrol	145	40.3	1.5

```
dataset.isnull().sum()
```

```
Model           0
Year            0
price           0
transmission    0
mileage         0
fuelType        0
tax             0
mpg             0
engineSize      0
dtype: int64
```

```
dataset.isnull().sum().sort_values(ascending = False)
```

```
Model           0
Year            0
price           0
transmission    0
mileage         0
fuelType        0
tax             0
mpg             0
engineSize      0
dtype: int64
```

```
dataset[dataset.isnull().any(axis = 1)].head()
```

	Model	Year	price	transmission	mileage	fuelType	tax	mpg	engineSize

```
dataset['Year'] = pd.to_datetime(dataset.Year, format = '%Y')
```

```
dataset.head()
```

	Model	Year	price	transmission	mileage	fuelType	tax	mpg	engineSiz
0	FIESTA	2017-01-01	12000	Automatic	15944	Petrol	150	57.7	1.
1	FOCUS	2018-01-01	14000	Manual	9083	Petrol	150	57.7	1.
2	FOCUS	2017-01-01	13000	Manual	12456	Petrol	150	57.7	1.

```
dataset['Model'] = dataset.Model.str.lower()
```

```
dataset.head()
```

	Model	Year	price	transmission	mileage	fuelType	tax	mpg	engineSize
0	fiesta	2017-01-01	12000	Automatic	15944	Petrol	150	57.7	1.0
1	focus	2018-01-01	14000	Manual	9083	Petrol	150	57.7	1.0

```
dataset['Model'] = dataset.Model.str.upper()
```

```
dataset.head()
```

	Model	Year	price	transmission	mileage	fuelType	tax	mpg	engineSiz
0	FIESTA	2017-01-01	12000	Automatic	15944	Petrol	150	57.7	1.
1	FOCUS	2018-01-01	14000	Manual	9083	Petrol	150	57.7	1.
2	FOCUS	2017-01-01	13000	Manual	12456	Petrol	150	57.7	1.

```
dataset1 = dataset.dropna()
```

```
dataset1.isnull().sum()
```

```
Model           0
Year            0
price           0
transmission    0
mileage         0
fuelType        0
tax             0
mpg             0
engineSize      0
dtype: int64
```

```
dataset1.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 17965 entries, 0 to 17964
Data columns (total 9 columns):
 #   Column        Non-Null Count  Dtype
---  ------        --------------  -----
 0   Model         17965 non-null  object
 1   Year          17965 non-null  datetime64[ns]
 2   price         17965 non-null  int64
 3   transmission  17965 non-null  object
 4   mileage       17965 non-null  int64
 5   fuelType      17965 non-null  object
 6   tax           17965 non-null  int64
 7   mpg           17965 non-null  float64
 8   engineSize    17965 non-null  float64
dtypes: datetime64[ns](1), float64(2), int64(3), object(3)
memory usage: 1.9+ MB
```

```
dataset1['mpg'] = dataset1[ 'mpg' ] . astype( 'int64' )
```

```
dataset1.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 17965 entries, 0 to 17964
Data columns (total 9 columns):
 #   Column        Non-Null Count  Dtype
---  ------        --------------  -----
 0   Model         17965 non-null  object
 1   Year          17965 non-null  datetime64[ns]
 2   price         17965 non-null  int64
 3   transmission  17965 non-null  object
 4   mileage       17965 non-null  int64
 5   fuelType      17965 non-null  object
 6   tax           17965 non-null  int64
 7   mpg           17965 non-null  int64
 8   engineSize    17965 non-null  float64
```

```
dtypes: datetime64[ns](1), float64(1), int64(4), object(3)
memory usage: 1.9+ MB
```

```
dataset1.describe() . round( 2)
```

	price	mileage	tax	mpg	engineSize
count	17965.00	17965.00	17965.00	17965.00	17965.00
mean	12279.76	23363.63	113.33	57.43	1.35
std	4741.38	19472.11	62.01	10.13	0.43
min	495.00	1.00	0.00	20.00	0.00
25%	8999.00	9987.00	30.00	52.00	1.00
50%	11291.00	18243.00	145.00	58.00	1.20
75%	15299.00	31064.00	145.00	65.00	1.50
max	54995.00	177644.00	580.00	201.00	5.00

```
dataset1 . head()
```

	Model	Year	price	transmission	mileage	fuelType	tax	mpg	engineSize
0	FIESTA	2017-01-01	12000	Automatic	15944	Petrol	150	57	1.0
1	FOCUS	2018-01-01	14000	Manual	9083	Petrol	150	57	1.0
2	FOCUS	2017-01-01	13000	Manual	12456	Petrol	150	57	1.0

```
dataset2 = dataset1[dataset1.engineSize > 1 ]
```

```
dataset1 = dataset1[ dataset1.engineSize <= 1]
```

```
dataset1.describe() . round( 2)
```

	price	mileage	tax	mpg	engineSize
count	7815.00	7815.00	7815.00	7815.00	7815.00
mean	11892.58	17953.42	106.99	59.08	0.99
std	3229.91	13421.77	61.10	5.33	0.08
min	3000.00	1.00	0.00	35.00	0.00
25%	9699.00	8389.00	30.00	55.00	1.00
50%	11250.00	14788.00	145.00	60.00	1.00
75%	13999.00	24313.00	145.00	65.00	1.00
max	30000.00	111530.00	265.00	85.00	1.00

```
dataset1[ 'total_price' ] = dataset1[ 'price' ] + dataset1 [ 'tax' ]
```

```
dataset1.head()
```

	Model	Year	price	transmission	mileage	fuelType	tax	mpg	engineSize
0	FIESTA	2017-01-01	12000	Automatic	15944	Petrol	150	57	1.0
1	FOCUS	2018-01-01	14000	Manual	9083	Petrol	150	57	1.0
2	FOCUS	2017-01-01	13000	Manual	12456	Petrol	150	57	1.0

```
dataset1 . insert(loc=3, column='year2' , value=dataset1.Year .dt .year)
```

```
dataset1. head()
```

	Model	Year	price	year2	year	transmission	mileage	fuelType	tax	mp
0	FIESTA	2017-01-01	12000	2017	2017	Automatic	15944	Petrol	150	5
1	FOCUS	2018-01-01	14000	2018	2018	Manual	9083	Petrol	150	5
2	FOCUS	2017-01-01	13000	2017	2017	Manual	12456	Petrol	150	5

```
dataset1 .groupby(by=[ 'Year' , 'year'] , as_index=False)[ 'price' ] . count() . head()
```

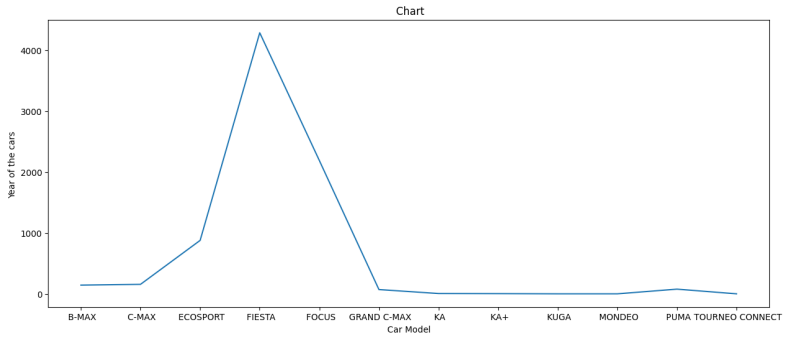
	Year	year	price
0	2008-01-01	2008	1
1	2010-01-01	2010	1
2	2012-01-01	2012	12
3	2013-01-01	2013	179
4	2014-01-01	2014	262

```
a = dataset1 .groupby(by=[ 'Year' , 'year'] , as_index=False)[ 'price' ] . count()
```

```
a
```

	Year	year	price
0	2008-01-01	2008	1
1	2010-01-01	2010	1
2	2012-01-01	2012	12
3	2013-01-01	2013	179
4	2014-01-01	2014	262
5	2015-01-01	2015	410
6	2016-01-01	2016	752
7	2017-01-01	2017	1953
8	2018-01-01	2018	2348
9	2019-01-01	2019	1718
10	2020-01-01	2020	179

```
cars = dataset1. groupby(by= [ 'Model'], as_index=False ) [ 'year' ]. count ( )
plt . subplots ( figsize=( 15, 6))
plt. plot (cars . Model, cars . year)
plt. xlabel ( 'Car Model' )
plt .ylabel( 'Year of the cars ' )
plt. title( ' Chart' )
plt .show()
```

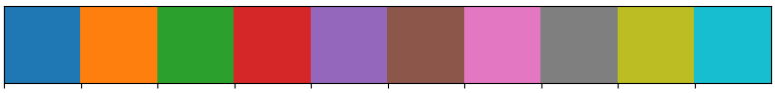



```
print ( 'The TOP 5 carss with highest price . . . ' )
dataset1 . sort_values(by='price' , ascending=False).head()
```

```
The TOP 5 carss with highest price . . .
```

	Model	Year	price	year2	year	transmission	mileage	fuelType	tax
7229	PUMA	2020-01-01	30000	2020	2020	Manual	150	Petrol	150
2011	FOCUS	2018-01-01	25998	2018	2018	Manual	13847	Petrol	145
13382	PUMA	2019-01-01	25820	2019	2019	Manual	3000	Petrol	145

```
import seaborn as sns
%matplotlib inline
color = sns . color_palette( )
sns .palplot (color)
```



```
dataset1 . head()
```

	Model	Year	price	year2	year	transmission	mileage	fuelType	tax	mp
0	FIESTA	2017-01-01	12000	2017	2017	Automatic	15944	Petrol	150	5
1	FOCUS	2018-01-01	14000	2018	2018	Manual	9083	Petrol	150	5
2	FOCUS	2017-01-01	13000	2017	2017	Manual	12456	Petrol	150	5

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```
dataset1.groupby( 'Model' )[ 'year' ]. any().value_counts() . sort_index().head()
```

```
True    12
Name: year, dtype: int64
```

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