ASSIGNMENT -2

DATA PREPROCESSING

IMPORT THE NECESSARY LIBRARIES

In [ ]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

IMPORT THE DATA SET INTO DATAFRAME

In [2]:
```
df=pd.read_csv('Churn_Modelling.csv')
```

In [3]:
```
df.head()
```

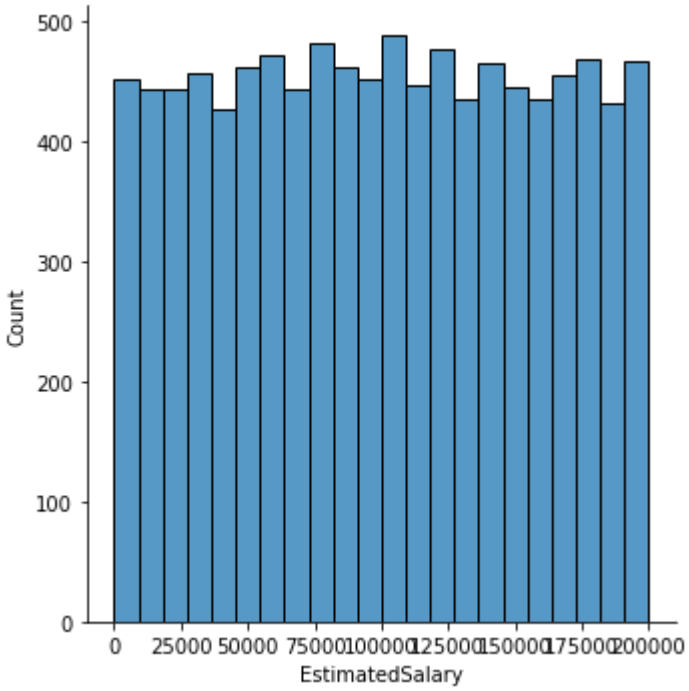
Out[3]:

	RowNumber	CustomerId	Surname	CreditScore	Geography	Gender	Age	Tenure	Balance	Num
0	1	15634602	Hargrave	619	France	Female	42	2	0.00	
1	2	15647311	Hill	608	Spain	Female	41	1	83807.86	
2	3	15619304	Onio	502	France	Female	42	8	159660.80	
3	4	15701354	Boni	699	France	Female	39	1	0.00	
4	5	15737888	Mitchell	850	Spain	Female	43	2	125510.82	

VISUALIZATION

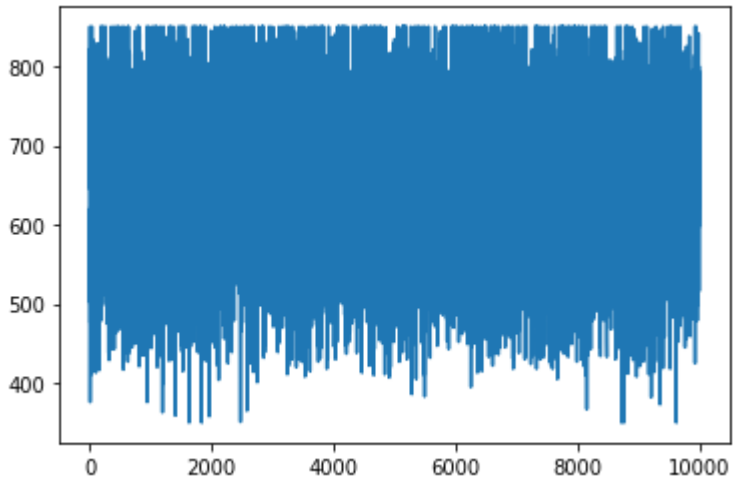
In [5]:
```
sns.displot(df['EstimatedSalary'])
```

Out[5]:
```
<seaborn.axisgrid.FacetGrid at 0x2ca1554ff98>
```



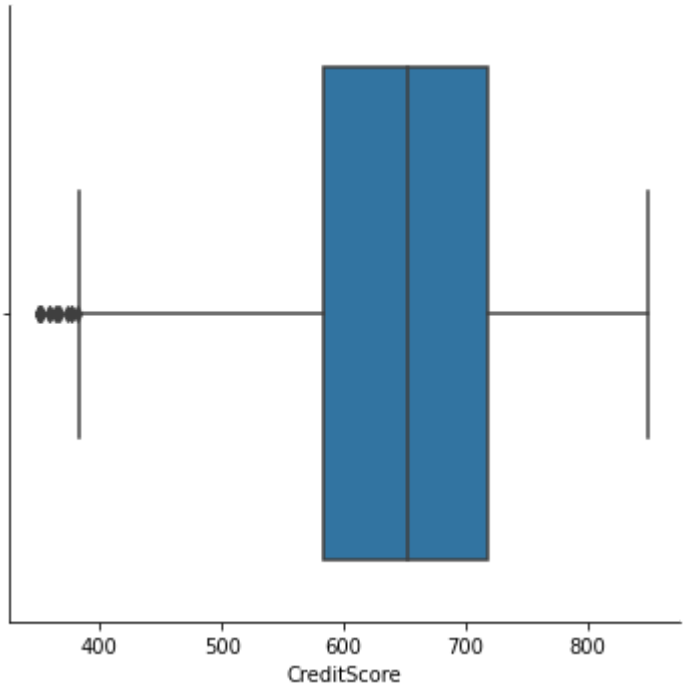
In [15]:
```
#univariate analysis
df.CreditScore.plot()
```

Out[15]: <AxesSubplot:>



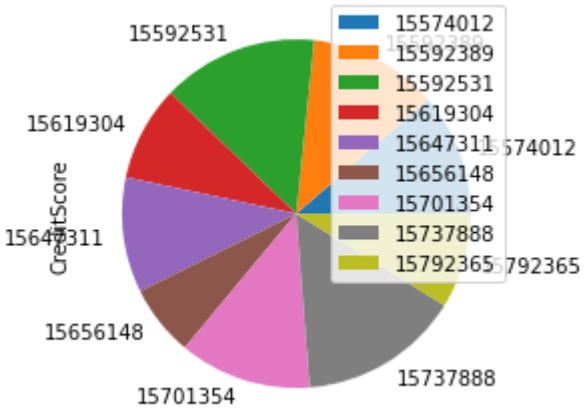
In [6]:
```
sns.catplot(x='CreditScore',kind='box',data=df)
```

Out[6]: <seaborn.axisgrid.FacetGrid at 0x2ca156c06a0>



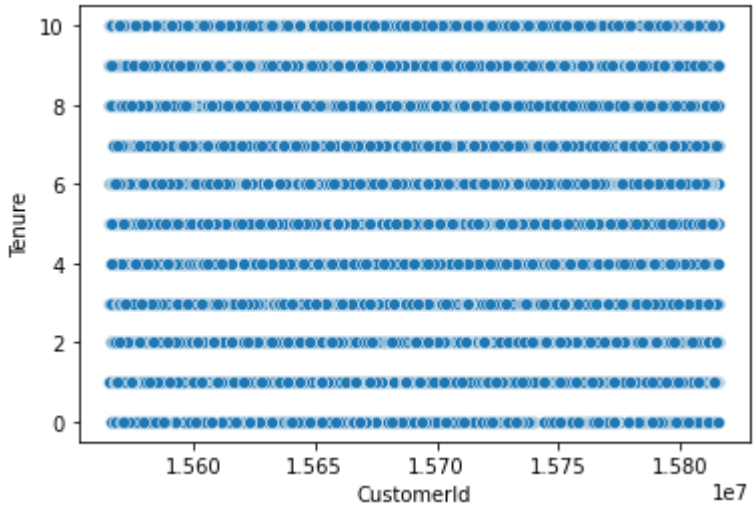
In [16]:
```
df[1:10].groupby(['CustomerId']).sum().plot(kind='pie', y='CreditScore')
```

Out[16]: <AxesSubplot:ylabel='CreditScore'>



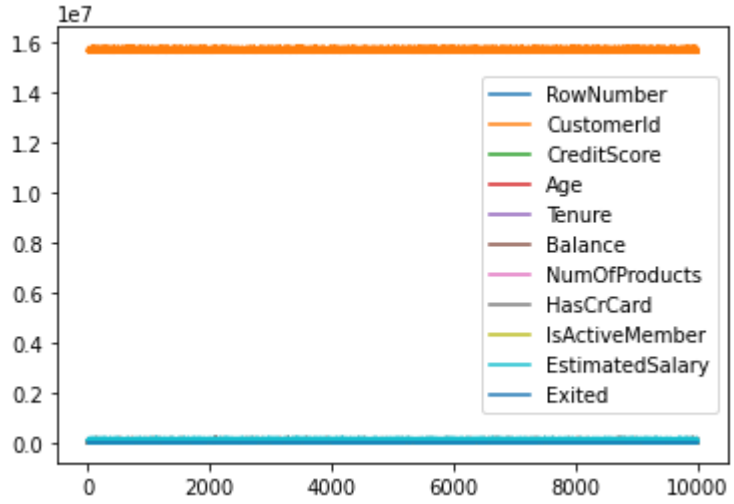
In [17]:
```
sns.scatterplot(df.CustomerId,df.Tenure)
plt.show()
```

```
C:\Users\darat\AppData\Local\Programs\Python\Python36\lib\site-packages\seaborn\_decorat
ors.py:43: FutureWarning: Pass the following variables as keyword args: x, y. From versi
on 0.12, the only valid positional argument will be `data`, and passing other arguments
without an explicit keyword will result in an error or misinterpretation.
  FutureWarning
```



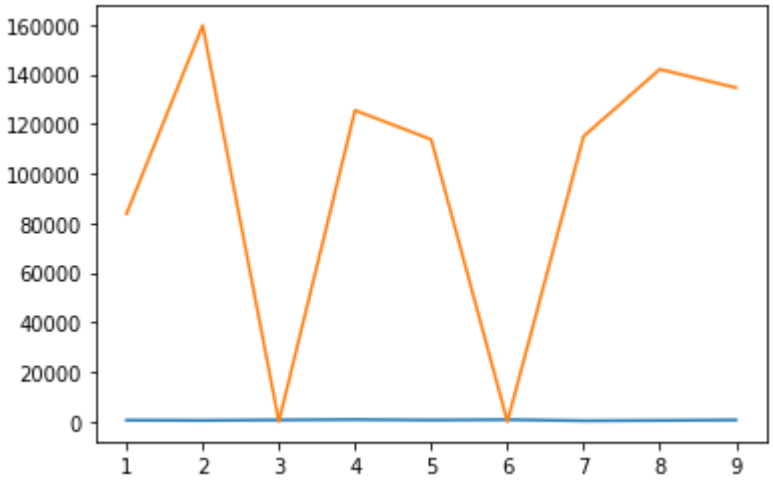
In [19]:
```
#multivariate analysis
df.plot()
```

Out[19]: <AxesSubplot:>



In [25]:
```
#bivariate analysis
df.CreditScore[1:10].plot()
df.Balance[1:10].plot()
```

Out[25]: <AxesSubplot:>



DESCRIPTIVE ANALYSIS

In [31]:
```
df.describe()
```

Out[31]:

	RowNumber	CustomerId	CreditScore	Age	Tenure	Balance	NumOfPro
count	10000.00000	1.000000e+04	10000.000000	10000.000000	10000.000000	10000.000000	10000.0(
mean	5000.50000	1.569094e+07	650.528800	38.921800	5.012800	76485.889288	1.5
std	2886.89568	7.193619e+04	96.653299	10.487806	2.892174	62397.405202	0.5
min	1.00000	1.556570e+07	350.000000	18.000000	0.000000	0.000000	1.0(
25%	2500.75000	1.562853e+07	584.000000	32.000000	3.000000	0.000000	1.0(
50%	5000.50000	1.569074e+07	652.000000	37.000000	5.000000	97198.540000	1.0(
75%	7500.25000	1.575323e+07	718.000000	44.000000	7.000000	127644.240000	2.0(
max	10000.00000	1.581569e+07	850.000000	92.000000	10.000000	250898.090000	4.0(

CHECKING FOR MISSING VALUES

In [32]:
```
df.isnull().any()
```

Out[32]:
```
RowNumber          False
CustomerId         False
Surname            False
CreditScore        False
Geography          False
Gender             False
Age                False
Tenure             False
Balance            False
NumOfProducts      False
HasCrCard          False
IsActiveMember     False
EstimatedSalary    False
```

```
Exited             False
dtype: bool
```

In [33]:
```
df.isnull().sum()
```

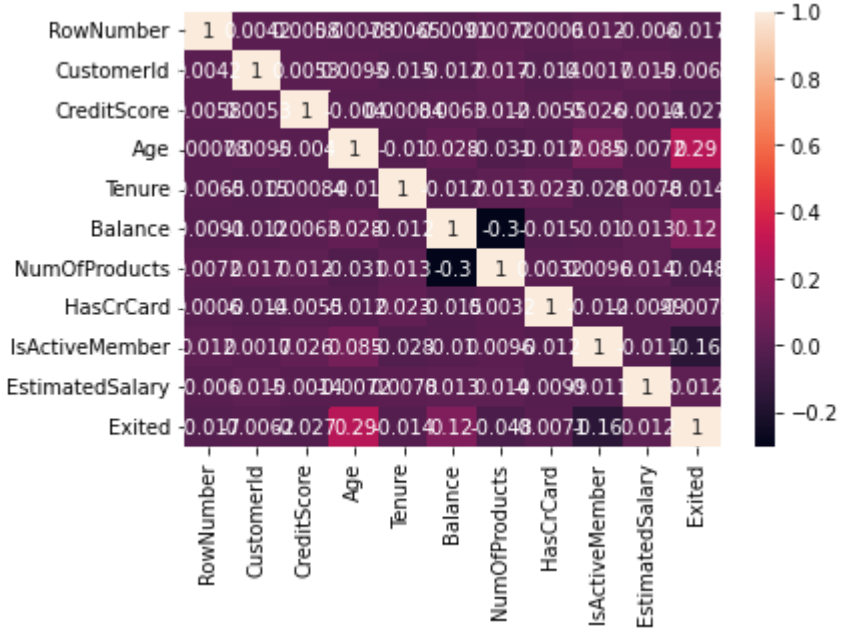
Out[33]:
```
RowNumber          0
CustomerId         0
Surname            0
CreditScore        0
Geography          0
Gender             0
Age                0
Tenure             0
Balance            0
NumOfProducts      0
HasCrCard          0
IsActiveMember     0
EstimatedSalary    0
Exited             0
dtype: int64
```

HANDLING VALUES

In [36]:
```
#No null values to handle
```

In [37]:
```
sns.heatmap(df.corr(),annot=True)
```

Out[37]: <AxesSubplot:>

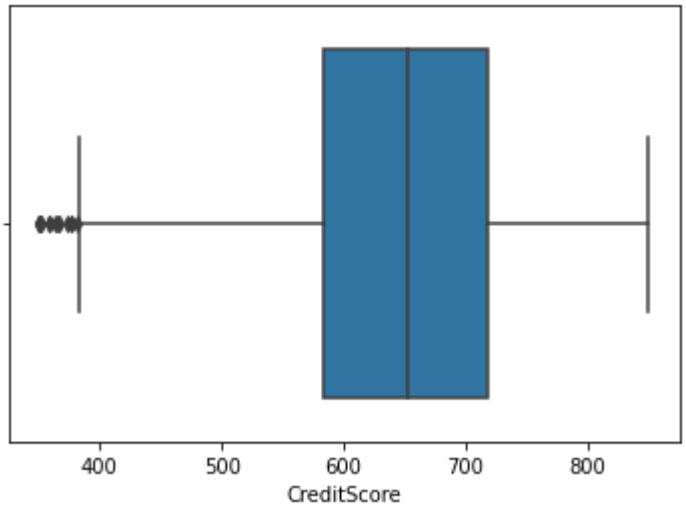


OUTLIERS

In [38]:
```
#occurence of outliers
sns.boxplot(df.CreditScore)
```

```
C:\Users\darat\AppData\Local\Programs\Python\Python36\lib\site-packages\seaborn\_decorat
ors.py:43: FutureWarning: Pass the following variable as a keyword arg: x. From version
0.12, the only valid positional argument will be `data`, and passing other arguments wit
hout an explicit keyword will result in an error or misinterpretation.
  FutureWarning
```

Out[38]: <AxesSubplot:xlabel='CreditScore'>



In [39]:
```
Q1= df.CreditScore.quantile(0.25)
Q3=df.CreditScore.quantile(0.75)
```

In [40]:
```
IQR=Q3-Q1
```

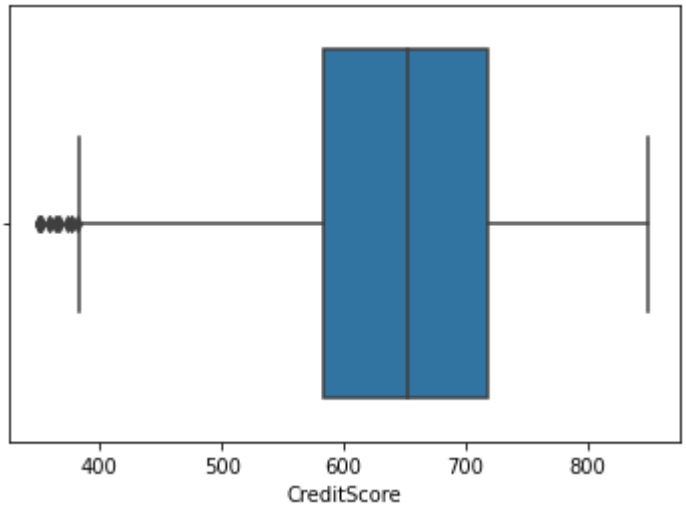
In [41]:
```
upper_limit =Q3 + 1.5*IQR
lower_limit =Q1 - 1.5*IQR
```

In [44]:
```
df['CreditScore'] = np.where(df['CreditScore']>upper_limit,30,df['CreditScore'])
```

In [45]:
```
sns.boxplot(df.CreditScore)
```

```
C:\Users\darat\AppData\Local\Programs\Python\Python36\lib\site-packages\seaborn\_decorat
ors.py:43: FutureWarning: Pass the following variable as a keyword arg: x. From version
0.12, the only valid positional argument will be `data`, and passing other arguments wit
hout an explicit keyword will result in an error or misinterpretation.
  FutureWarning
```

Out[45]: <AxesSubplot:xlabel='CreditScore'>



CATEGORICAL COLUMNS _ENCODING

In [46]:
```
#Label encoder
from sklearn.preprocessing import LabelEncoder
```

In [47]:
```
le=LabelEncoder()
```

In [52]:
```
df.Gender= le.fit_transform(df.Gender)
```

In [54]:
```
df.head(5)
```

Out[54]:

	RowNumber	CustomerId	Surname	CreditScore	Geography	Gender	Age	Tenure	Balance	Num
0	1	15634602	Hargrave	619	France	0	42	2	0.00	
1	2	15647311	Hill	608	Spain	0	41	1	83807.86	
2	3	15619304	Onio	502	France	0	42	8	159660.80	
3	4	15701354	Boni	699	France	0	39	1	0.00	
4	5	15737888	Mitchell	850	Spain	0	43	2	125510.82	

In [55]:
```
#one hot encoding
df_main=pd.get_dummies(df,columns=['Geography'])
df_main.head()
```

Out[55]:

	RowNumber	CustomerId	Surname	CreditScore	Gender	Age	Tenure	Balance	NumOfProducts
0	1	15634602	Hargrave	619	0	42	2	0.00	1
1	2	15647311	Hill	608	0	41	1	83807.86	1
2	3	15619304	Onio	502	0	42	8	159660.80	3

	RowNumber	CustomerId	Surname	CreditScore	Gender	Age	Tenure	Balance	NumOfProducts
3	4	15701354	Boni	699	0	39	1	0.00	2
4	5	15737888	Mitchell	850	0	43	2	125510.82	1

SEPARATING INDEPENDENT AND DEPENDENT VARIABLES

In [70]:
```
X=df_main.drop(columns=['EstimatedSalary'],axis=1)
X.head()
X_scaled=pd.DataFrame(scale(X),columns=X.columns)
X_scaled.head()
```

Out[70]:

	RowNumber	CustomerId	CreditScore	Gender	Age	Tenure	Balance	NumOfProducts	Ha
0	-1.731878	-0.783213	-0.326221	-1.095988	0.293517	-1.041760	-1.225848	-0.911583	
1	-1.731531	-0.606534	-0.440036	-1.095988	0.198164	-1.387538	0.117350	-0.911583	-
2	-1.731185	-0.995885	-1.536794	-1.095988	0.293517	1.032908	1.333053	2.527057	
3	-1.730838	0.144767	0.501521	-1.095988	0.007457	-1.387538	-1.225848	0.807737	-
4	-1.730492	0.652659	2.063884	-1.095988	0.388871	-1.041760	0.785728	-0.911583	

In [71]:
```
y=df_main.EstimatedSalary
y
```

Out[71]:
```
0       101348.88
1       112542.58
2       113931.57
3        93826.63
4        79084.10
          ...
9995     96270.64
9996    101699.77
9997     42085.58
9998     92888.52
9999     38190.78
Name: EstimatedSalary, Length: 10000, dtype: float64
```

SCALING

In [72]:
```
from sklearn.preprocessing import scale
```

In [73]:
```
X_scaled=pd.DataFrame(scale(X),columns=X.columns)
X_scaled.head()
```

Out[73]:

	RowNumber	CustomerId	CreditScore	Gender	Age	Tenure	Balance	NumOfProducts	Ha
0	-1.731878	-0.783213	-0.326221	-1.095988	0.293517	-1.041760	-1.225848	-0.911583	
1	-1.731531	-0.606534	-0.440036	-1.095988	0.198164	-1.387538	0.117350	-0.911583	-
2	-1.731185	-0.995885	-1.536794	-1.095988	0.293517	1.032908	1.333053	2.527057	
3	-1.730838	0.144767	0.501521	-1.095988	0.007457	-1.387538	-1.225848	0.807737	-
4	-1.730492	0.652659	2.063884	-1.095988	0.388871	-1.041760	0.785728	-0.911583	

TRAIN AND TEST DATA

In [74]:
```
from sklearn.model_selection import train_test_split
X_train,X_test,y_train,y_test =train_test_split(X_scaled,y, test_size=0.3,random_state=
```

In [66]:
```
X_train.shape
```

Out[66]: (7000, 14)

In [67]:
```
X_test.shape
```

Out[67]: (3000, 14)

In [68]:
```
y_train.shape
```

Out[68]: (7000,)

In [69]:
```
y_test.shape
```

Out[69]: (3000,)