In [ ]:

```
import numpy as np
import pandas as pd
```

In [ ]:

```
# (2) loading dataset

df=pd.read_csv("/content/Churn_Modelling.csv")
```

In [ ]:

```
df.head()
```

Out[ ]:

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

In [ ]:

```
# (4) descriptive statistics on the dataset

df.describe()
```

Out[ ]:

	RowNumber	CustomerId	CreditScore	Age	Tenure	Balance	NumOfProducts	HasCrCard	Is
count	10000.00000	1.000000e+04	10000.000000	10000.000000	10000.000000	10000.000000	10000.000000	10000.00000	
mean	5000.50000	1.569094e+07	650.528800	38.921800	5.012800	76485.889288	1.530200	0.70550	
std	2886.89568	7.193619e+04	96.653299	10.487806	2.892174	62397.405202	0.581654	0.45584	
min	1.00000	1.556570e+07	350.000000	18.000000	0.000000	0.000000	1.000000	0.00000	
25%	2500.75000	1.562853e+07	584.000000	32.000000	3.000000	0.000000	1.000000	0.00000	
50%	5000.50000	1.569074e+07	652.000000	37.000000	5.000000	97198.540000	1.000000	1.00000	
75%	7500.25000	1.575323e+07	718.000000	44.000000	7.000000	127644.240000	2.000000	1.00000	
max	10000.00000	1.581569e+07	850.000000	92.000000	10.000000	250898.090000	4.000000	1.00000	

In [ ]:

```
# (5) Handle the Missing values

df.isnull().sum()
```

Out[ ]:

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

In [ ]:

```
# (6) finding outliers and replacing

df['Age'].mean()
```

Out[ ]:

```
38.9218
```

In [ ]:

```
df['Age'].median()
```

Out[ ]:

```
37.0
```

In [ ]:

```
df['Age'].std()
```

Out[ ]:

```
10.487806451704609
```

In [ ]:

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

Out[ ]:

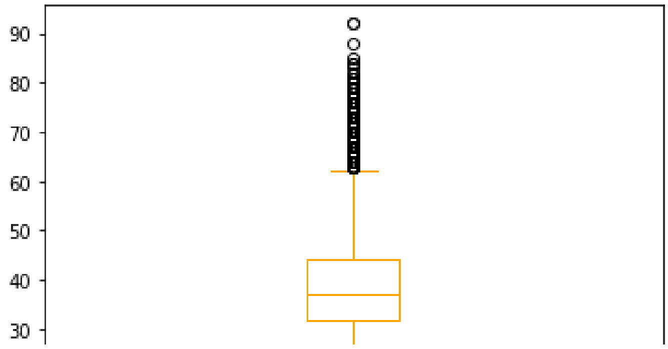
```
37    478
38    477
35    474
36    456
34    447
     ...
92      2
82      1
88      1
85      1
83      1
Name: Age, Length: 70, dtype: int64
```

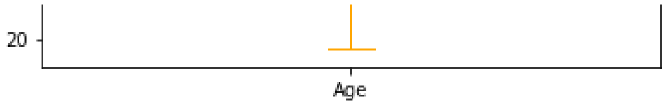
In [ ]:

```
import matplotlib.pyplot as plt
df.boxplot(column=['Age'],grid=False, color='orange')
```

Out[ ]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f0738ad0b10>
```





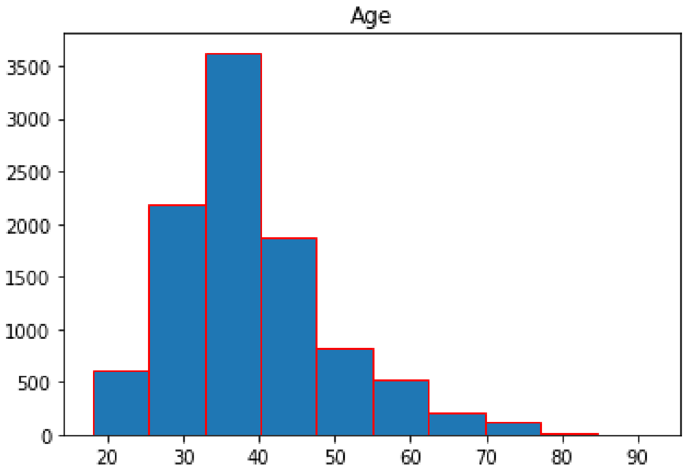
In [ ]:

```
# (7) Check for Categorical columns and perform encoding

df.hist(column='Age',grid=False,edgecolor='red')
```

Out[ ]:

```
array([[<matplotlib.axes._subplots.AxesSubplot object at 0x7f0738a2c490>]],
      dtype=object)
```

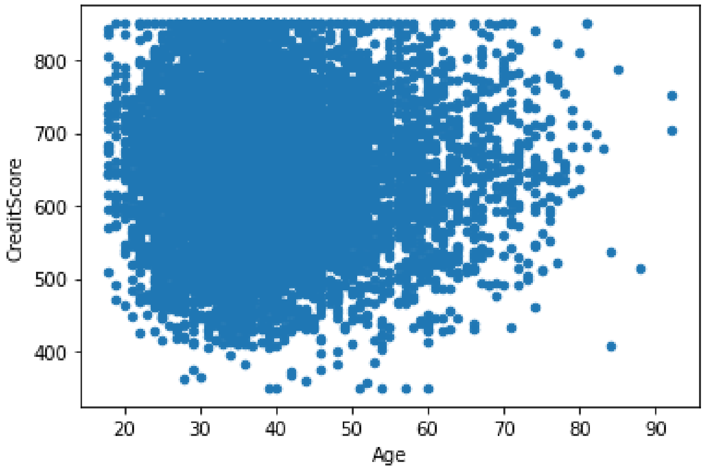


In [ ]:

```
df.plot.scatter('Age','CreditScore')
```

Out[ ]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f073850ebd0>
```

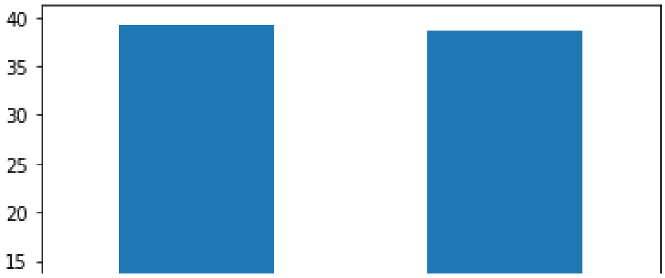


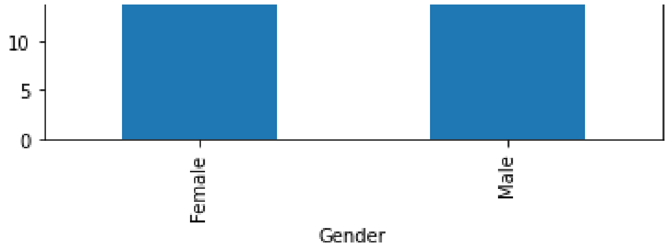
In [ ]:

```
df.groupby('Gender')['Age'].mean().plot.bar()
```

Out[ ]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f073848a9d0>
```





In [ ]:

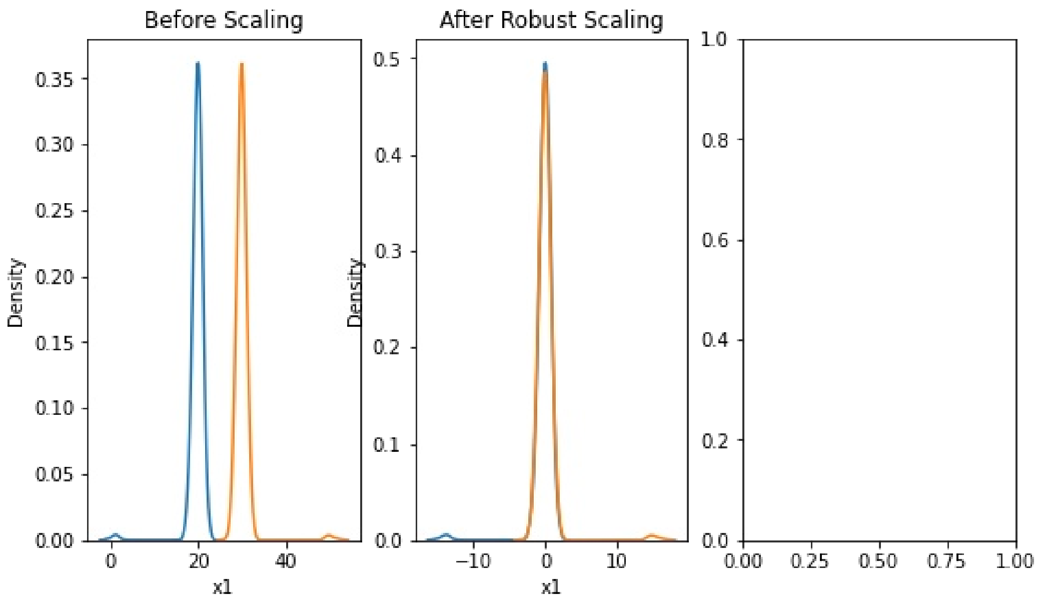
```
from sklearn import preprocessing
import matplotlib
import matplotlib.pyplot as plt
import seaborn as sns
```

In [ ]:

```
x = pd.DataFrame({
    'x1': np.concatenate([np.random.normal(20, 1, 2000), np.random.normal(1, 1, 20)]),
    'x2': np.concatenate([np.random.normal(30, 1, 2000), np.random.normal(50, 1, 20)]),
})
scaler = preprocessing.RobustScaler()
robust_scaled_df = scaler.fit_transform(x)
robust_scaled_df = pd.DataFrame(robust_scaled_df, columns =['x1', 'x2'])
fig, (ax1, ax2, ax3) = plt.subplots(ncols = 3, figsize =(9, 5))
ax1.set_title('Before Scaling')
sns.kdeplot(x['x1'], ax = ax1)
sns.kdeplot(x['x2'], ax = ax1)
ax2.set_title('After Robust Scaling')
sns.kdeplot(robust_scaled_df['x1'], ax = ax2)
sns.kdeplot(robust_scaled_df['x2'], ax = ax2)
```

Out[ ]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f072b91e850>
```



In [ ]:

```
from sklearn.preprocessing import LabelEncoder
```

In [ ]:

```
le = LabelEncoder()
```

In [ ]:

```
from sklearn.model_selection import train_test_split
```

In [ ]:

```
# (8) splitting of dependent and independent datas

x=df.iloc[:,0:8].values
y=df.iloc[:,8:15].values
```

In [ ]:

```
# (10) splitting of data into training and testing

xtrain, xtest, ytrain, ytest = train_test_split(x, y, test_size=0.3, random_state=0)
```

In [ ]:

```
# (9) Scale the independent variables

ytrain.shape, ytest.shape
```

Out[ ]:

```
((7000, 6), (3000, 6))
```