In [1]:
```
import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
```

In [2]:
```
df = pd.read_csv("Social_Network_Ads.csv")
```

In [3]:
```
#check the head
df.head()
```

Out[3]:

	User ID	Gender	Age	EstimatedSalary	Purchased
0	15624510	Male	19	19000	0
1	15810944	Male	35	20000	0
2	15668575	Female	26	43000	0
3	15603246	Female	27	57000	0
4	15804002	Male	19	76000	0

In [4]:
```
#Check tail
df.tail()
```

Out[4]:

	User ID	Gender	Age	EstimatedSalary	Purchased
395	15691863	Female	46	41000	1
396	15706071	Male	51	23000	1
397	15654296	Female	50	20000	1
398	15755018	Male	36	33000	0
399	15594041	Female	49	36000	1

In [5]:
```
df.dtypes
```

Out[5]:
```
User ID             int64
Gender             object
Age                 int64
EstimatedSalary     int64
Purchased           int64
dtype: object
```

In [6]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 400 entries, 0 to 399
Data columns (total 5 columns):
 #   Column           Non-Null Count  Dtype 
---  ------           --------------  ----- 
 0   User ID          400 non-null    int64 
 1   Gender           400 non-null    object
 2   Age              400 non-null    int64 
 3   EstimatedSalary  400 non-null    int64 
 4   Purchased        400 non-null    int64 
dtypes: int64(4), object(1)
memory usage: 15.8+ KB
```

In [7]:
```
df.describe()
```

Out[7]:

	User ID	Age	EstimatedSalary	Purchased
count	4.000000e+02	400.000000	400.000000	400.000000
mean	1.569154e+07	37.655000	69742.500000	0.357500
std	7.165832e+04	10.482877	34096.960282	0.479864
min	1.556669e+07	18.000000	15000.000000	0.000000
25%	1.562676e+07	29.750000	43000.000000	0.000000
50%	1.569434e+07	37.000000	70000.000000	0.000000
75%	1.575036e+07	46.000000	88000.000000	1.000000
max	1.581524e+07	60.000000	150000.000000	1.000000

In [8]:
```
#checking the duplicacy
df.duplicated().sum()
```

Out[8]:
```
0
```

In [9]:
```
df.isnull().sum()
```

Out[9]:
```
User ID            0
Gender             0
Age                0
EstimatedSalary    0
Purchased          0
dtype: int64
```

```
In [10]: df.corr()
```

Out[10]:

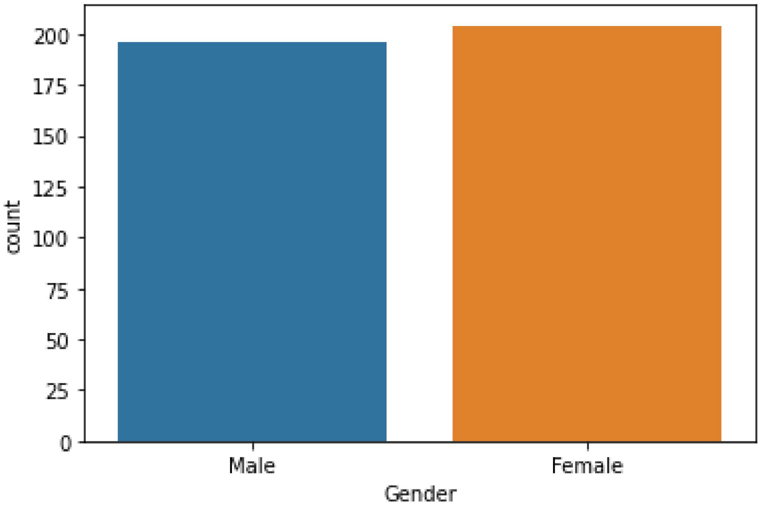
	User ID	Age	EstimatedSalary	Purchased
User ID	1.000000	-0.000721	0.071097	0.007120
Age	-0.000721	1.000000	0.155238	0.622454
EstimatedSalary	0.071097	0.155238	1.000000	0.362083
Purchased	0.007120	0.622454	0.362083	1.000000

```
In [11]: df["Gender"].value_counts(normalize = True)*100
```

```
Out[11]: Female    51.0
         Male      49.0
         Name: Gender, dtype: float64
```

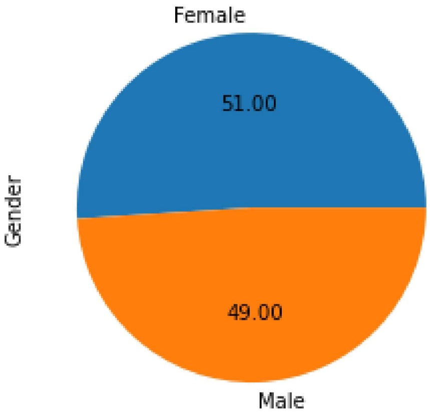
```
In [12]: sns.countplot(x = "Gender",data = df)
```

```
Out[12]: <AxesSubplot:xlabel='Gender', ylabel='count'>
```



```
In [13]: df["Gender"].value_counts().plot(kind ="pie",autopct = "%.2f")
```

```
Out[13]: <AxesSubplot:ylabel='Gender'>
```



In [14]:

```
def age_group(pi):
    if pi > 20 and pi <= 30:
        Age_group = "21-30"
    elif pi > 30 and pi <= 40:
        Age_group = "31-40"
    elif pi > 40 and pi <= 50:
        Age_group = "41-50"
    else:
        Age_group = "Above 50"
    return (Age_group)
```

In [15]:

```
df["Age_group"] = df["Age"].apply(age_group)
```

In [16]:

```
df
```

Out[16]:

	User ID	Gender	Age	EstimatedSalary	Purchased	Age_group
0	15624510	Male	19	19000	0	Above 50
1	15810944	Male	35	20000	0	31-40
2	15668575	Female	26	43000	0	21-30
3	15603246	Female	27	57000	0	21-30
4	15804002	Male	19	76000	0	Above 50
...	...	...	...	...	...	...
395	15691863	Female	46	41000	1	41-50
396	15706071	Male	51	23000	1	Above 50
397	15654296	Female	50	20000	1	41-50
398	15755018	Male	36	33000	0	31-40
399	15594041	Female	49	36000	1	41-50

400 rows × 6 columns

In [17]:

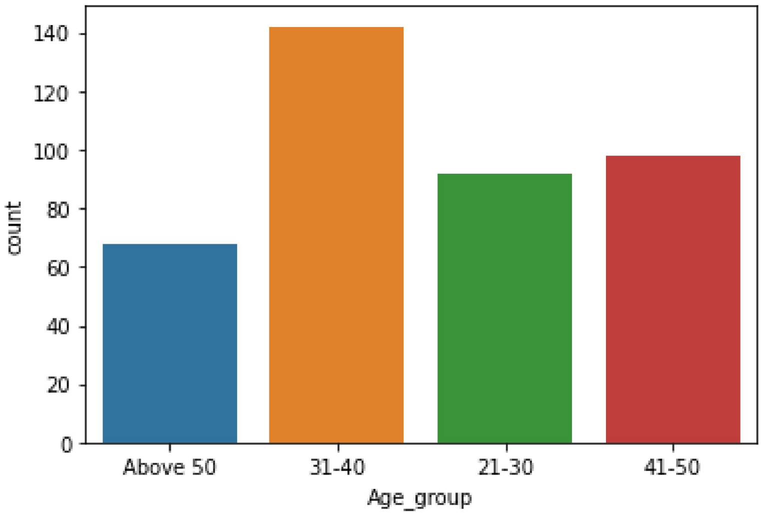
```
df.columns
```

Out[17]:

```
Index(['User ID', 'Gender', 'Age', 'EstimatedSalary', 'Purchased',
       'Age_group'],
      dtype='object')
```

```
In [18]: sns.countplot(data = df, x = "Age_group")
```

```
Out[18]: <AxesSubplot:xlabel='Age_group', ylabel='count'>
```



```
In [19]: pd.crosstab(df["Age_group"],df["Purchased"],margins=True)
```

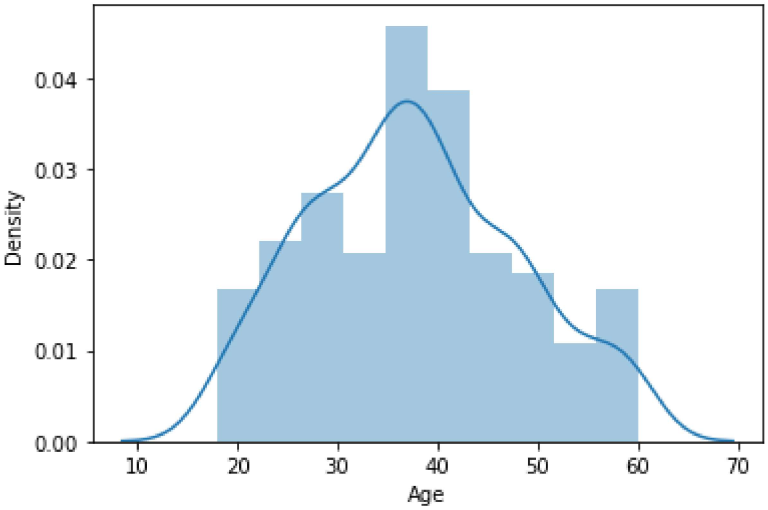
```
Out[19]:
```

Purchased	0	1	All
Age_group			
21-30	86	6	92
31-40	109	33	142
41-50	39	59	98
Above 50	23	45	68
All	257	143	400

In [20]:
```
sns.distplot(df["Age"])
```

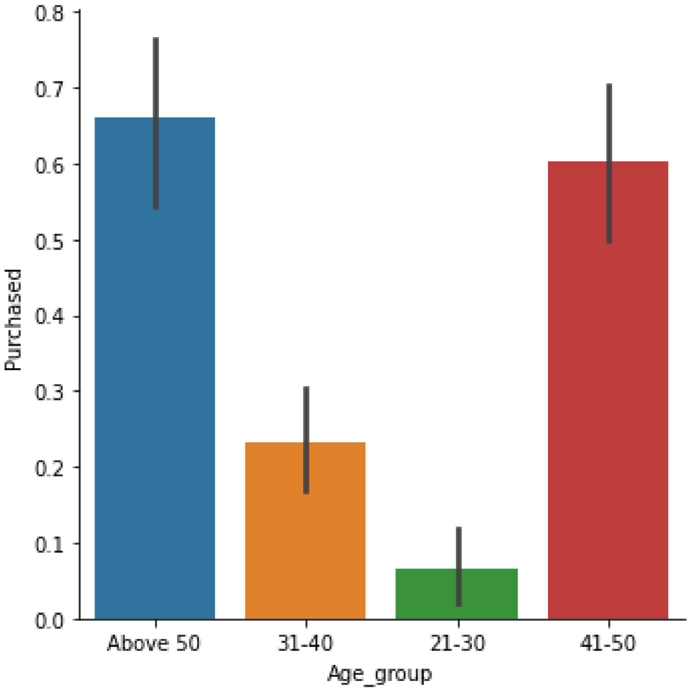
```
C:\Users\HP\anaconda3\lib\site-packages\seaborn\distributions.py:2619: Future
Warning: `distplot` is a deprecated function and will be removed in a future
version. Please adapt your code to use either `displot` (a figure-level funct
ion with similar flexibility) or `histplot` (an axes-level function for histo
grams).
  warnings.warn(msg, FutureWarning)
```

Out[20]:
```
<AxesSubplot:xlabel='Age', ylabel='Density'>
```

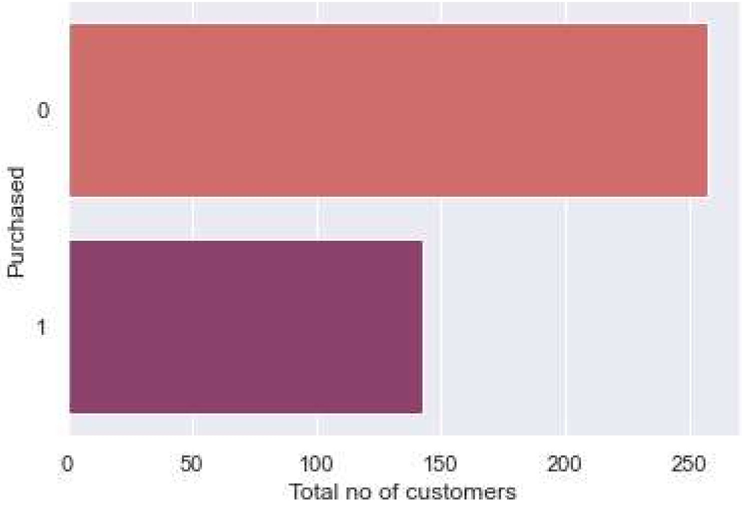


In [21]:
```
sns.catplot(data=df, y="Purchased",x="Age_group", kind="bar")
```

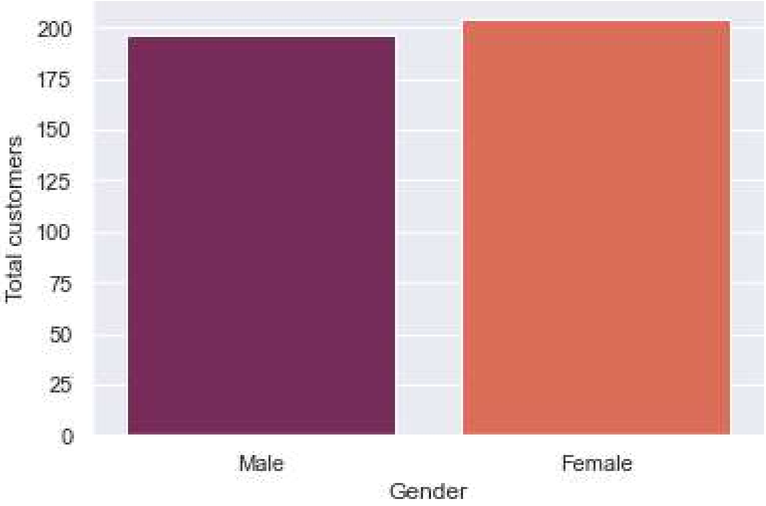
Out[21]:
```
<seaborn.axisgrid.FacetGrid at 0x275ca99cb50>
```



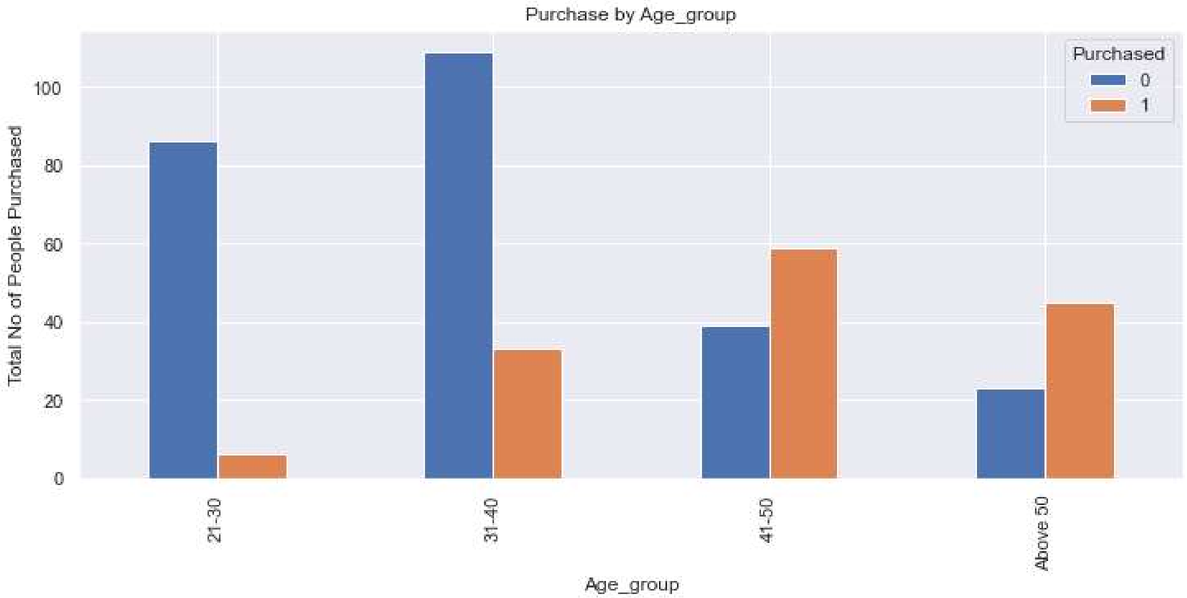
In [22]:
```
sns.set_theme(style="darkgrid")
sns.countplot(y="Purchased",data=df, palette = "flare")
plt.ylabel("Purchased")
plt.xlabel("Total no of customers")
plt.show()
```



In [23]:
```
sns.set_theme(style = "darkgrid")
sns.countplot(data=df,x="Gender", palette = "rocket")
plt.xlabel("Gender")
plt.ylabel("Total customers")
plt.show()
```

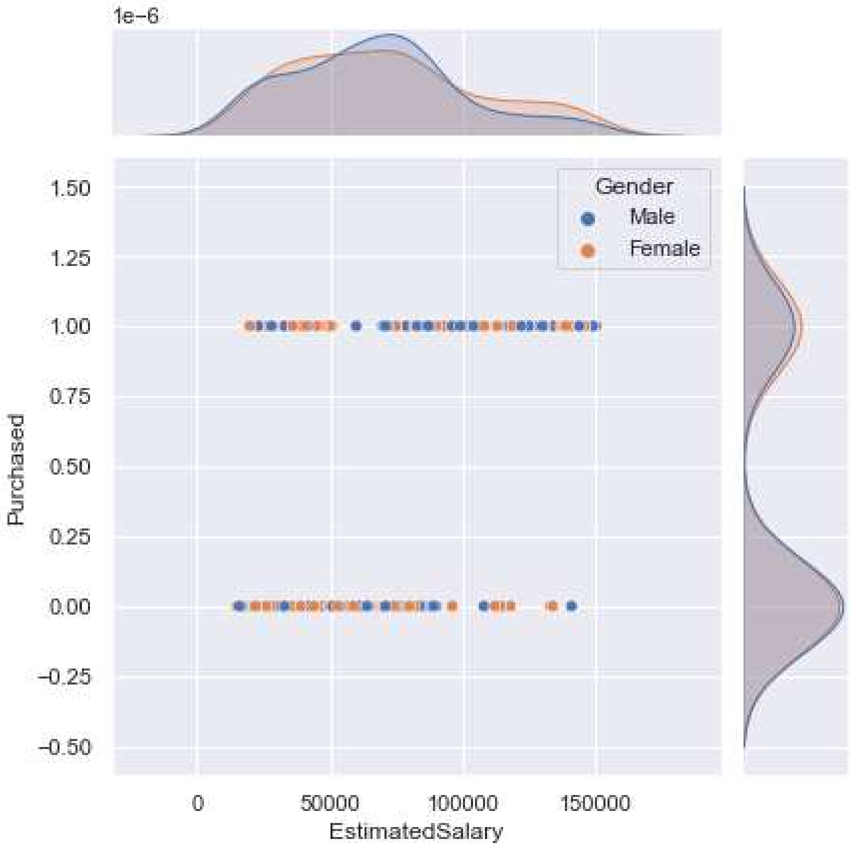


In [24]:
```
pd.crosstab(df["Age_group"],df["Purchased"]).plot(kind="bar",figsize=(12,5))
plt.title("Purchase by Age_group")
plt.xlabel("Age_group")
plt.ylabel("Total No of People Purchased")
plt.show()
```



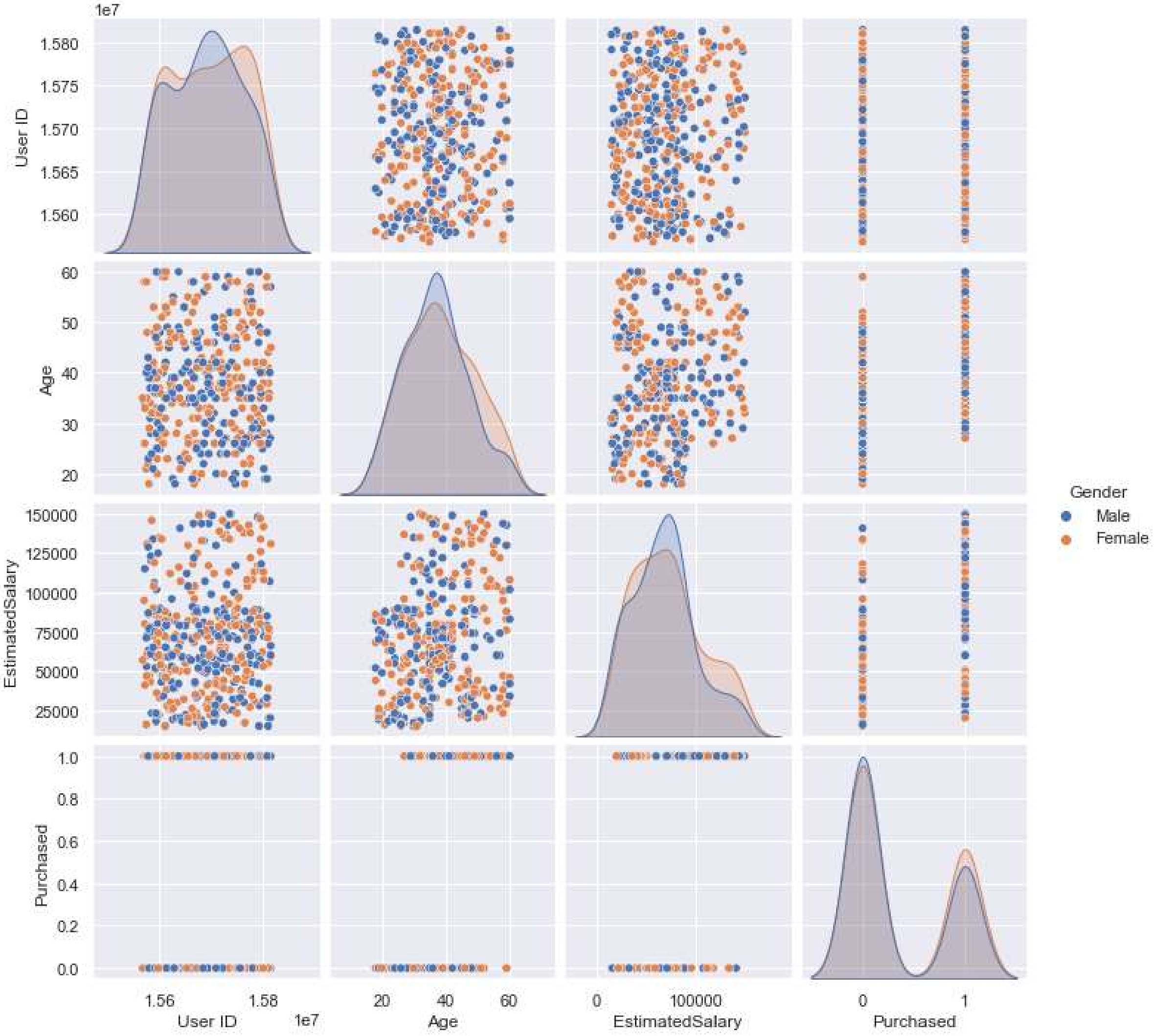
In [25]:
```
sns.jointplot(data = df,x="EstimatedSalary",y="Purchased",hue = "Gender",kind
```

Out[25]:
```
<seaborn.axisgrid.JointGrid at 0x275caf246d0>
```



```
In [26]: sns.pairplot(data = df,hue="Gender")
```

```
Out[26]: <seaborn.axisgrid.PairGrid at 0x275cb071c40>
```



In [27]:

```
df
```

Out[27]:

	User ID	Gender	Age	EstimatedSalary	Purchased	Age_group
0	15624510	Male	19	19000	0	Above 50
1	15810944	Male	35	20000	0	31-40
2	15668575	Female	26	43000	0	21-30
3	15603246	Female	27	57000	0	21-30
4	15804002	Male	19	76000	0	Above 50
...	...	...	...	...	...	...
395	15691863	Female	46	41000	1	41-50
396	15706071	Male	51	23000	1	Above 50
397	15654296	Female	50	20000	1	41-50
398	15755018	Male	36	33000	0	31-40
399	15594041	Female	49	36000	1	41-50

400 rows × 6 columns

In [28]:

```
x = df.iloc[:,2:4].values
```

In [29]:

```
y = df.iloc[:,-2].values
```

In [30]:

```
from sklearn.model_selection import train_test_split
x_train,x_test,y_train,y_test = train_test_split(x,y,test_size = 0.3 , random_

from sklearn.neighbors import KNeighborsClassifier
KNClassifier = KNeighborsClassifier(n_neighbors = 17)
KNClassifier.fit(x_train,y_train)
from sklearn.metrics import classification_report

y_pred = KNClassifier.predict(x_test)

print(classification_report(y_test,y_pred))
```

```
              precision    recall  f1-score   support

           0       0.85      0.97      0.91        79
           1       0.93      0.66      0.77        41

    accuracy                           0.87       120
   macro avg       0.89      0.82      0.84       120
weighted avg       0.88      0.87      0.86       120
```

In [31]:

```
from sklearn.metrics import confusion_matrix
from sklearn.metrics import accuracy_score
KNAcc = accuracy_score(y_pred,y_test)
print(confusion_matrix(y_test,y_pred))
print("K neighbors Accuracy score is: {:.2f}%".format(KNAcc*100))
```

```
[[77  2]
 [14 27]]
K neighbors Accuracy score is: 86.67%
```

In [ ]: