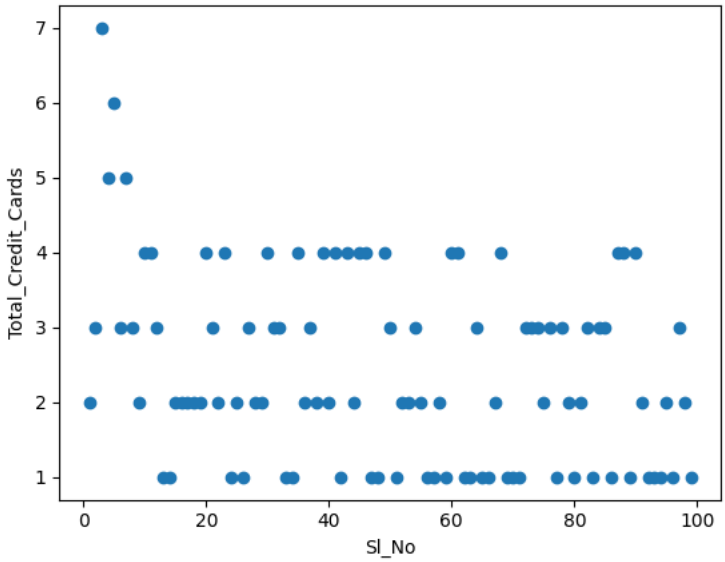
```
from sklearn.cluster import KMeans
import pandas as pd
from sklearn.preprocessing import MinMaxScaler
from matplotlib import pyplot as plt
%matplotlib inline
```

```
df = pd.read_csv('/content/Credit Card Customer Data.csv')
df.head()
```

	Sl_No	Customer Key	Avg_Credit_Limit	Total_Credit_Cards	Total_visits_bank	Total_visits_online	Total_calls_made
0	1	87073	100000	2	1	1	0
1	2	38414	50000	3	0	10	9
2	3	17341	50000	7	1	3	4
3	4	40496	30000	5	1	1	4
4	5	47437	100000	6	0	12	3

```
plt.scatter(df.Sl_No,df['Total_Credit_Cards'])
plt.xlabel('Sl_No')
plt.ylabel('Total_Credit_Cards')
```

```
Text(0, 0.5, 'Total_Credit_Cards')
```




```
km = KMeans(n_clusters=3)
y_predicted = km.fit_predict(df[['Sl_No','Total_Credit_Cards']])
y_predicted
```

```
/usr/local/lib/python3.10/dist-packages/sklearn/cluster/_kmeans.py:870: FutureWarning: The default value of `n_init` will change fr
  warnings.warn(
array([1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
       1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2,
       2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 0,
       0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
       0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0], dtype=int32)
```

```
df['cluster']=y_predicted
df.head()
```

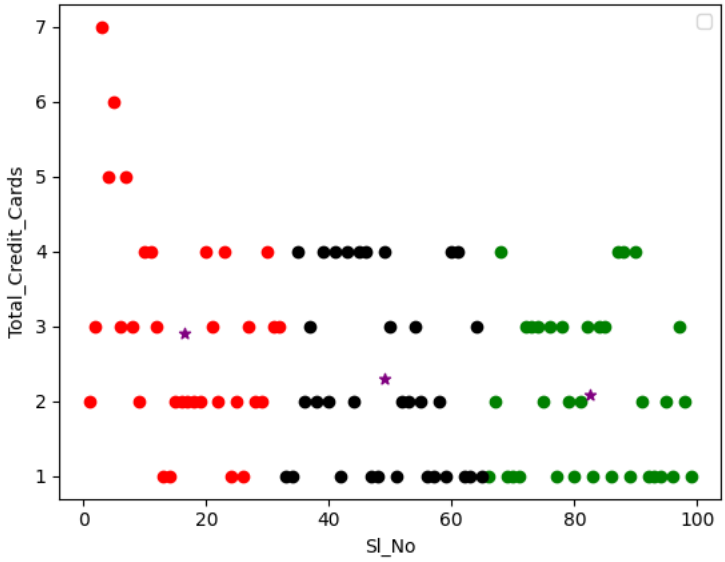
	Sl_No	Customer Key	Avg_Credit_Limit	Total_Credit_Cards	Total_visits_bank	Total_vi
0	1	87073	100000	2	1	
1	2	38414	50000	3	0	
2	3	17341	50000	7	1	
3	4	40496	30000	5	1	

```
km.cluster_centers_
```

```
array([[82.5       ,  2.08823529],
       [16.5       ,  2.90625   ],
       [49.        ,  2.3030303 ]])
```

```
df1 = df[df.cluster==0]
df2 = df[df.cluster==1]
df3 = df[df.cluster==2]
plt.scatter(df1.Sl_No,df1['Total_Credit_Cards'],color='green')
plt.scatter(df2.Sl_No,df2['Total_Credit_Cards'],color='red')
plt.scatter(df3.Sl_No,df3['Total_Credit_Cards'],color='black')
plt.scatter(km.cluster_centers_[:,0],km.cluster_centers_[:,1],color='purple',marker='*')
plt.xlabel('Sl_No')
plt.ylabel('Total_Credit_Cards')
plt.legend()
```

```
WARNING:matplotlib.legend:No artists with labels found to put in legend.  Note that a
<matplotlib.legend.Legend at 0x7c762c65a0e0>
```




```
scaler = MinMaxScaler()
scaler.fit(df[['Total_Credit_Cards']])
df['Total_Credit_Cards'] = scaler.transform(df[['Total_Credit_Cards']])
scaler.fit(df[['Sl_No']])
df['Sl_No'] = scaler.transform(df[['Sl_No']])
df.head()
```

	Sl_No	Customer Key	Avg_Credit_Limit	Total_Credit_Cards	Total_visits_bank	Total
0	0.000000	87073	100000	0.166667	1	
1	0.010204	38414	50000	0.333333	0	
2	0.020408	17341	50000	1.000000	1	
3	0.030612	40496	30000	0.666667	1	

```
plt.scatter(df.Sl_No,df['Total_Credit_Cards'])
```

```
<matplotlib.collections.PathCollection at 0x7c762c400700>
```


```
km = KMeans(n_clusters=3)
y_predicted = km.fit_predict(df[['Sl_No','Total_Credit_Cards']])
y_predicted
```

```
/usr/local/lib/python3.10/dist-packages/sklearn/cluster/_kmeans.py:870: FutureWarning: The default value of `n_init` will change fr
  warnings.warn(
array([0, 1, 1, 1, 1, 1, 1, 1, 0, 1, 1, 1, 0, 0, 0, 0, 0, 0, 0, 1, 1, 0,
       1, 0, 0, 0, 1, 0, 0, 1, 1, 1, 0, 0, 1, 0, 1, 0, 1, 0, 1, 0, 1, 0,
       1, 1, 0, 0, 1, 1, 0, 0, 0, 1, 0, 0, 0, 2, 2, 1, 1, 2, 2, 2, 2, 2,
       2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2,
       2, 2, 2, 2, 2, 2, 2, 2, 2, 2], dtype=int32)
```

```
df['cluster']=y_predicted
df.head()
```

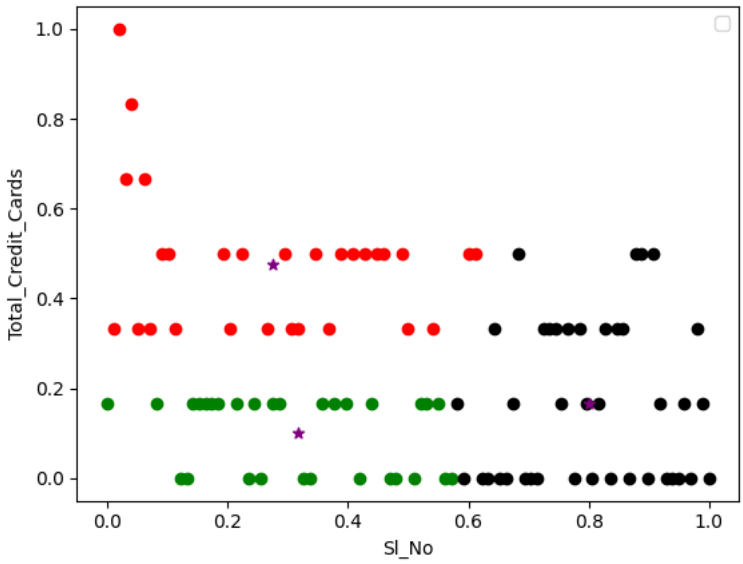
	Sl_No	Customer Key	Avg_Credit_Limit	Total_Credit_Cards	Total_visits_bank	Total
0	0.000000	87073	100000	0.166667	1	
1	0.010204	38414	50000	0.333333	0	
2	0.020408	17341	50000	1.000000	1	
3	0.030612	40496	30000	0.666667	1	

```
km.cluster_centers_
```

```
array([[0.3170068 , 0.1       ],
       [0.2755102 , 0.47701149],
       [0.8       , 0.16666667]])
```

```
df1 = df[df.cluster==0]
df2 = df[df.cluster==1]
df3 = df[df.cluster==2]
plt.scatter(df1.Sl_No,df1['Total_Credit_Cards'],color='green')
plt.scatter(df2.Sl_No,df2['Total_Credit_Cards'],color='red')
plt.scatter(df3.Sl_No,df3['Total_Credit_Cards'],color='black')
plt.scatter(km.cluster_centers_[:,0],km.cluster_centers_[:,1],color='purple',marker='*')
plt.xlabel('Sl_No')
plt.ylabel('Total_Credit_Cards')
plt.legend()
```

```
WARNING:matplotlib.legend:No artists with labels found to put in legend.  Note that a
<matplotlib.legend.Legend at 0x7c762fb862f0>
```




```
sse = []
k_rng = range(1,10)
for k in k_rng:
  km = KMeans(n_clusters = k)
```

```
    km.fit(df[['Sl_No','Total_Credit_Cards']])
    sse.append(km.inertia_)

plt.xlabel('K')
plt.ylabel('Sum of squared error')
plt.plot(k_rng,sse)
```

```
/usr/local/lib/python3.10/dist-packages/sklearn/cluster/_kmeans.py:870: FutureWarning
  warnings.warn(
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/usr/local/lib/python3.10/dist-packages/sklearn/cluster/_kmeans.py:870: FutureWarning
  warnings.warn(
[<matplotlib.lines.Line2D at 0x7c762fc8bf10>]
```