```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.preprocessing import StandardScaler
from sklearn.neighbors import KNeighborsClassifier
from sklearn.model_selection import train_test_split
from sklearn.metrics import confusion_matrix, f1_score, recall_
```

```
df = pd.read_csv("diabetes.csv")
```

```
df.head()
```

	Pregnancies	Glucose	BloodPressure	SkinThickness	Insulin	BMI	DiabetesPedigre
0	6	148	72	35	0	33.6	
1	1	85	66	29	0	26.6	
2	8	183	64	0	0	23.3	
3	1	89	66	23	94	28.1	
4	0	137	40	35	168	43.1	

```
df.shape
```

```
(768, 9)
```

```
df.describe()
```

	Pregnancies	Glucose	BloodPressure	SkinThickness	Insulin	BMI
count	768.000000	768.000000	768.000000	768.000000	768.000000	768.000000
mean	3.845052	120.894531	69.105469	20.536458	79.799479	31.992578
std	3.369578	31.972618	19.355807	15.952218	115.244002	7.884160
min	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
25%	1.000000	99.000000	62.000000	0.000000	0.000000	27.300000
50%	3.000000	117.000000	72.000000	23.000000	30.500000	32.000000
75%	6.000000	140.250000	80.000000	32.000000	127.250000	36.600000
max	17.000000	199.000000	122.000000	99.000000	846.000000	67.100000

```
#replace zeros
zero_not_accepted=["Glucose","BloodPressure","SkinThickness","B
for column in zero_not_accepted:
 df[column]=df[column].replace(0,np.NaN)
 mean=int(df[column].mean(skipna=True))
 df[column]=df[column].replace(np.NaN,mean)
```

```
df["Glucose"]
```

```
0      148.0
1       85.0
2      183.0
3       89.0
4      137.0
       ...
763    101.0
764    122.0
765    121.0
766    126.0
767     93.0
Name: Glucose, Length: 768, dtype: float64
```

```
#split dataset
X=df.iloc[:,0:8]
y=df.iloc[:,8]
X_train,X_test,y_train,y_test=train_test_split(X,y,random_state
```

```
#feature Scaling
sc_X=StandardScaler()
X_train=sc_X.fit_transform(X_train)
X_test=sc_X.transform(X_test)
```

```
knn=KNeighborsClassifier(n_neighbors=11)
```

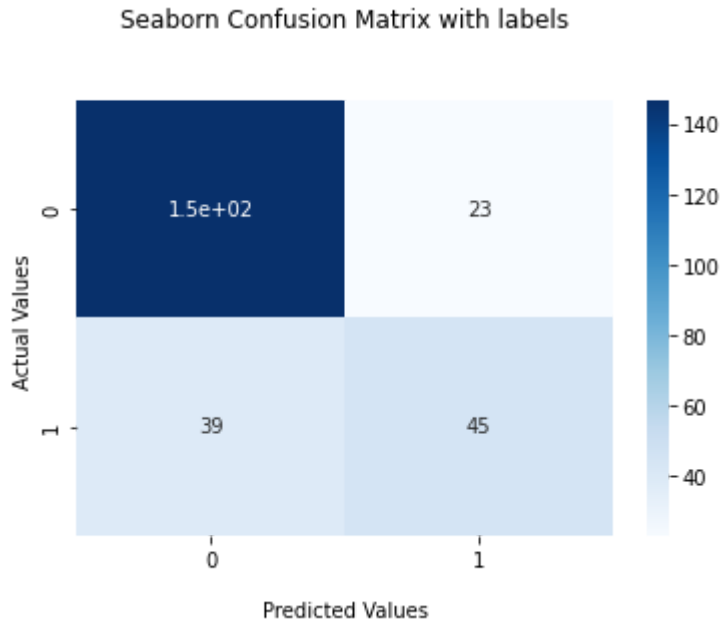
```
knn.fit(X_train,y_train)
```

```
KNeighborsClassifier(n_neighbors=11)
```

```
y_pred=knn.predict(X_test)
```

```
#Evaluate The Model
cf_matrix=confusion_matrix(y_test,y_pred)
```

```
ax = sns.heatmap(cf_matrix, annot=True, cmap='Blues')
ax.set_title('Seaborn Confusion Matrix with labels\n\n');
ax.set_xlabel('\nPredicted Values')
ax.set_ylabel('Actual Values ');
## Display the visualization of the Confusion Matrix.
plt.show()
```




```
tn, fp, fn, tp = confusion_matrix(y_test, y_pred ).ravel()
tn, fp, fn, tp
```

```
(147, 23, 39, 45)
```

```
#The accuracy rate is equal to (tn+tp)/(tn+tp+fn+fp)
accuracy_score(y_test,y_pred)
```

```
0.7559055118110236
```

```
#The precision is the ratio of tp/(tp + fp)
precision_score(y_test,y_pred)
```

```
0.6617647058823529
```

```
##The recall is the ratio of tp/(tp + fn)
recall_score(y_test,y_pred)
```

```
0.5357142857142857
```

```
#error rate=1-accuracy which is lies bertween 0 and 1
error_rate=1-accuracy_score(y_test,y_pred)
```

```
error_rate
```

```
0.2440944881889764
```