Libraries and Classes

In [20]:
```
import pandas as pd
import seaborn as sns
from sklearn.preprocessing import MinMaxScaler
from sklearn.model_selection import train_test_split
from sklearn.neighbors import KNeighborsClassifier
from sklearn.metrics import ConfusionMatrixDisplay
from sklearn.metrics import accuracy_score,classification_report
import matplotlib.pyplot as plt
import numpy as np
!pip install imbalanced-learn #oversampling and undersample
```

```
ERROR: Invalid requirement: '#oversampling'
```

In [21]:
```
# Reading CSV dataset
df=pd.read_csv("diabetes.csv")
df
```

Out[21]:

	Pregnancies	Glucose	BloodPressure	SkinThickness	Insulin	BMI	Pedigree	Age	Out
0	6	148	72	35	0	33.6	0.627	50	
1	1	85	66	29	0	26.6	0.351	31	
2	8	183	64	0	0	23.3	0.672	32	
3	1	89	66	23	94	28.1	0.167	21	
4	0	137	40	35	168	43.1	2.288	33	
...	...	...	...	...	...	...	...	...	
763	10	101	76	48	180	32.9	0.171	63	
764	2	122	70	27	0	36.8	0.340	27	
765	5	121	72	23	112	26.2	0.245	30	
766	1	126	60	0	0	30.1	0.349	47	
767	1	93	70	31	0	30.4	0.315	23	

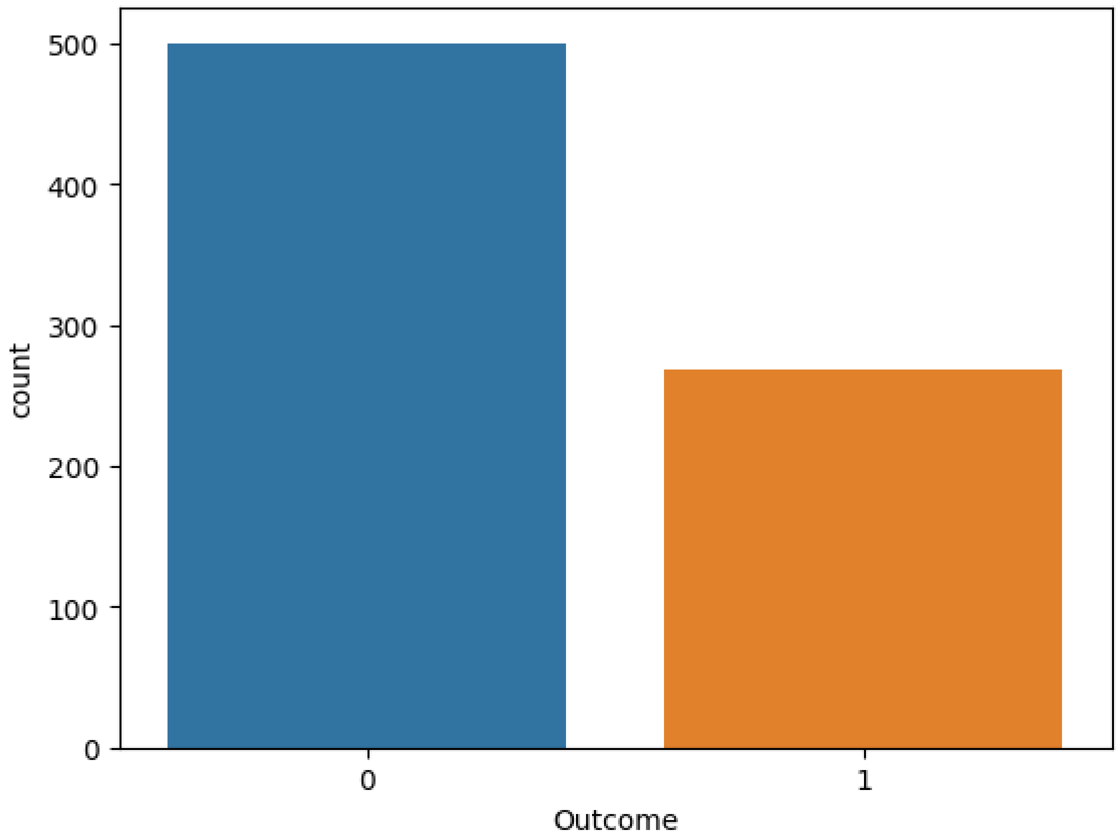
768 rows × 9 columns

Defining variables x and y

In [22]:
```
x=df.drop('Outcome', axis=1)
y=df['Outcome']
```

In [23]:
```
sns.countplot(x=y)
```

Out[23]: <AxesSubplot: xlabel='Outcome', ylabel='count'>



In [24]:
```
y.value_counts()
```

Out[24]:
```
0    500
1    268
Name: Outcome, dtype: int64
```

Over sampling of imbalanced values

In [25]:
```
from imblearn.over_sampling import RandomOverSampler
ros=RandomOverSampler(random_state=0)
x_yes,y_res=ros.fit_resample(x,y)
y_res.value_counts()
```

Out[25]:
```
1    500
0    500
Name: Outcome, dtype: int64
```

Scaling of features using min-max scaling technique

In [26]:
```
scaler=MinMaxScaler()
x_scaled=scaler.fit_transform(x_yes)
x_scaled
```

Out[26]:
```
array([[0.35294118, 0.74371859, 0.59016393, ..., 0.50074516, 0.23441503,
         0.48333333],
        [0.05882353, 0.42713568, 0.54098361, ..., 0.39642325, 0.11656704,
         0.16666667],
        [0.47058824, 0.91959799, 0.52459016, ..., 0.34724292, 0.25362938,
         0.18333333],
        ...,
        [0.05882353, 0.90954774, 0.52459016, ..., 0.50819672, 0.10674637,
         0.28333333],
        [0.35294118, 0.59798995, 0.40983607, ..., 0.40387481, 0.529462  ,
         0.2       ],
        [0.41176471, 0.51758794, 0.54098361, ..., 0.58271237, 0.11357814,
         0.16666667]])
```

Spliting datset into training and testing dataset in ratio 75:25

In [27]:
```
x_train,x_test,y_train,y_test=train_test_split(x_scaled,y_res,random_state=
print(x_scaled.shape)
print(x_test,x_train)
```

```
(1000, 8)
[[0.         0.73366834 0.57377049 ... 0.56482861 0.10930828 0.11666667]
 [0.29411765 0.83417085 0.62295082 ... 0.68107303 0.1118702  0.1       ]
 [0.82352941 0.50251256 0.63934426 ... 0.54545455 0.14261315 0.41666667]
 ...
 [0.47058824 0.91959799 0.52459016 ... 0.34724292 0.25362938 0.18333333]
 [0.47058824 0.63316583 0.60655738 ... 0.38599106 0.03586678 0.3       ]
 [0.41176471 0.71356784 0.73770492 ... 0.45305514 0.02134927 0.36666667]]
[[0.         0.4321608  0.55737705 ... 0.53353204 0.06831768 0.06666667]
 [0.58823529 0.55778894 0.57377049 ... 0.40983607 0.02690009 0.31666667]
 [0.11764706 0.55276382 0.60655738 ... 0.4828614  0.264731   0.1       ]
 ...
 [0.23529412 0.47236181 0.53278689 ... 0.3681073  0.02988898 0.        ]
 [0.64705882 0.42713568 0.60655738 ... 0.4485842  0.09479078 0.23333333]
 [0.29411765 0.68341709 0.67213115 ... 0.         0.23996584 0.8       ]]
```

Model training using KNN algo.

In [28]:
```
knn=KNeighborsClassifier(n_neighbors=5)
knn.fit(x_train,y_train)
```

Out[28]:
```
▾ KNeighborsClassifier
KNeighborsClassifier()
```

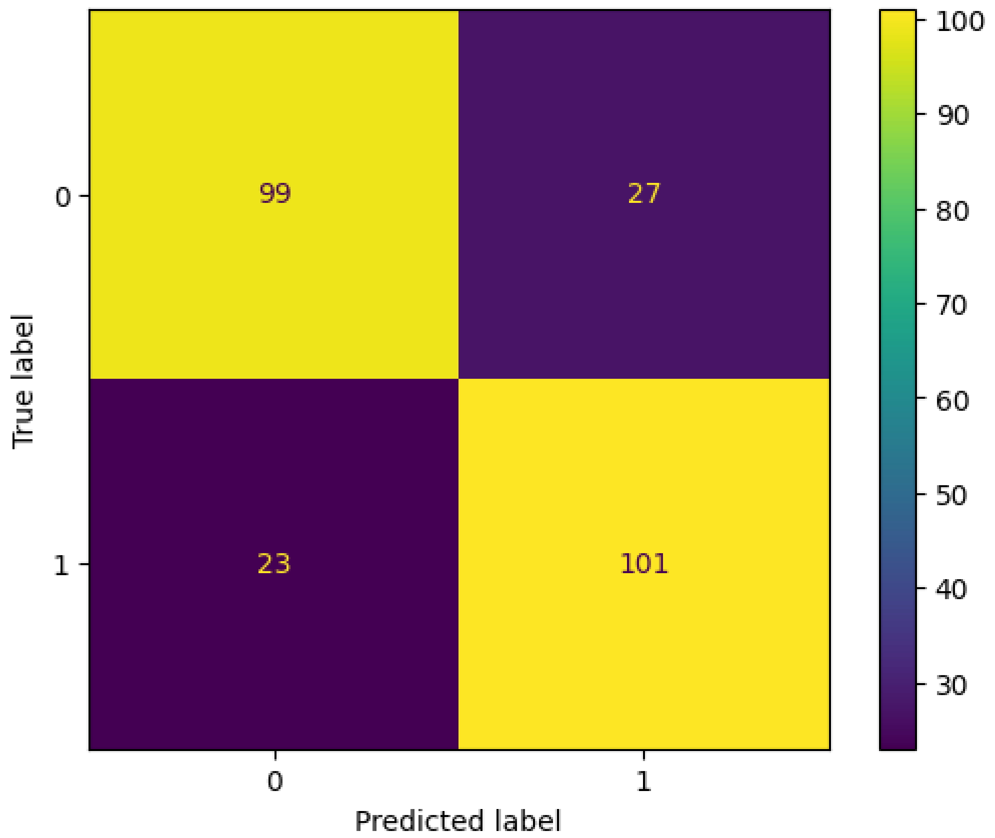
In [29]:
```
y_pred=knn.predict(x_test)
print(x_test,y_pred)
```

```
[[0.         0.73366834 0.57377049 ... 0.56482861 0.10930828 0.11666667]
 [0.29411765 0.83417085 0.62295082 ... 0.68107303 0.1118702  0.1       ]
 [0.82352941 0.50251256 0.63934426 ... 0.54545455 0.14261315 0.41666667]
 ...
 [0.47058824 0.91959799 0.52459016 ... 0.34724292 0.25362938 0.18333333]
 [0.47058824 0.63316583 0.60655738 ... 0.38599106 0.03586678 0.3       ]
 [0.41176471 0.71356784 0.73770492 ... 0.45305514 0.02134927 0.36666667]]
[0 1 1 0 1 1 0 1 1 1 1 0 1 0 1 0 1 1 0 0 1 0 0 0 1 1 1 0 0 0 1 1 1 1 1 0 1
 1 0 0 1 1 0 1 1 1 1 0 0 1 0 0 0 0 0 0 0 1 1 1 1 1 0 0 0 0 1 0 0 1 0 0 1 0
 1 1 0 1 0 0 1 1 0 1 0 1 1 0 0 1 0 0 1 0 0 0 1 0 0 0 1 1 0 0 0 1 0 1 1 1 0
 1 0 1 0 0 1 0 1 0 1 1 0 0 0 1 0 1 0 0 0 1 0 0 0 0 1 1 0 1 0 0 0 0 0 1 0 1
 1 1 0 1 0 1 1 1 0 1 1 0 0 1 0 1 1 1 0 1 0 0 0 1 0 1 0 0 0 1 1 1 0 0 1 0 1
 1 0 1 0 0 1 1 1 1 1 0 1 1 0 0 0 0 1 1 0 0 1 1 0 1 0 1 1 1 0 1 0 1 1 0 1 1
 1 1 1 1 1 0 0 1 0 0 1 1 0 0 0 1 1 0 1 1 0 1 1 0 1 1 0 1]
```

Performance of model using confusion matrix

In [30]:
```
ConfusionMatrixDisplay.from_predictions(y_test,y_pred)
```

Out[30]:
```
<sklearn.metrics._plot.confusion_matrix.ConfusionMatrixDisplay at 0x16d696
e60e0>
```



In [31]:
```
print(classification_report(y_test,y_pred))
```

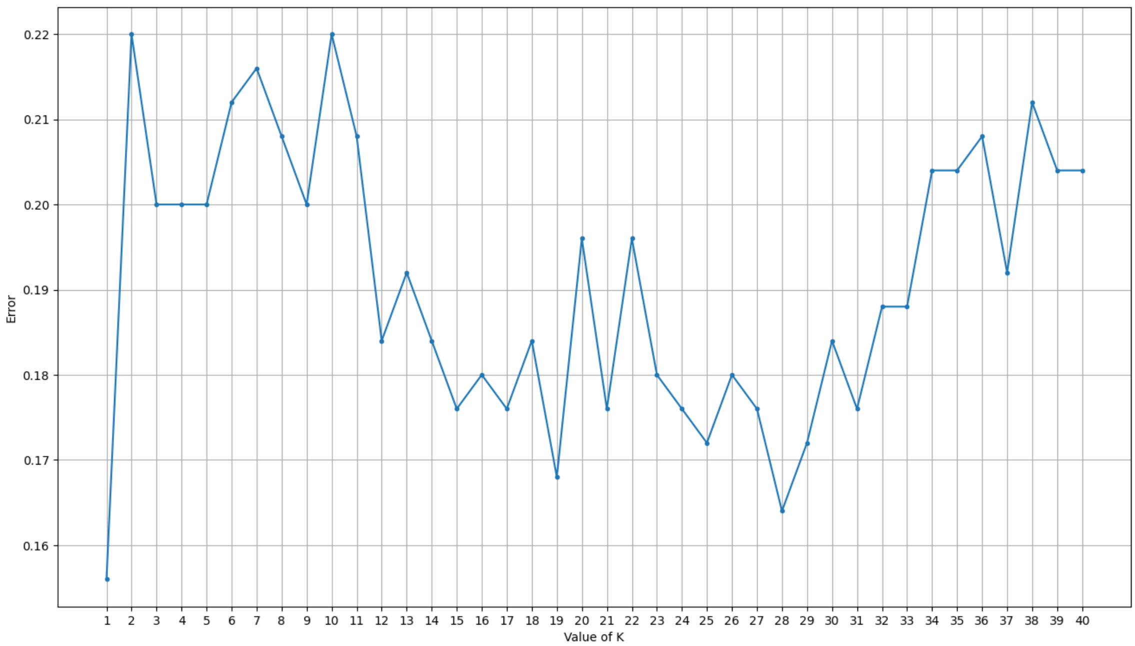
```
              precision    recall  f1-score   support

           0       0.81      0.79      0.80       126
           1       0.79      0.81      0.80       124

    accuracy                           0.80       250
   macro avg       0.80      0.80      0.80       250
weighted avg       0.80      0.80      0.80       250
```

Calculating error of model

In [32]:
```
error=[]
for k in range (1,41):
    knn=KNeighborsClassifier(n_neighbors=k)
    knn.fit(x_train,y_train)
    pred=knn.predict(x_test)
    error.append(np.mean(pred !=y_test))
```

In [33]:
```
plt.figure(figsize=(16,9))
plt.xlabel('Value of K')
plt.ylabel('Error')
plt.grid()
plt.xticks(range(1,41))
plt.plot(range(1,41),error,marker='.')
```

Out[33]:
```
[<matplotlib.lines.Line2D at 0x16d004ea9b0>]
```



Trained model for least error at value of k as 28

In [34]:
```
knn=KNeighborsClassifier(n_neighbors=28)
knn.fit(x_train,y_train)
y_pred=knn.predict(x_test)
print(classification_report(y_test,y_pred))
```

```
              precision    recall  f1-score   support

           0       0.83      0.85      0.84       126
           1       0.84      0.82      0.83       124

    accuracy                           0.84       250
   macro avg       0.84      0.84      0.84       250
weighted avg       0.84      0.84      0.84       250
```