In [7]:
```
import pandas as pd
import numpy as np
```

In [8]:
```
df=pd.read_csv('diabetes.csv')
df.head()
```

Out[8]:

	Pregnancies	Glucose	BloodPressure	SkinThickness	Insulin	BMI	DiabetesPedigreeFunction	Age	Outcome
0	6	148	72	35	0	33.6	0.627	50	1
1	1	85	66	29	0	26.6	0.351	31	0
2	8	183	64	0	0	23.3	0.672	32	1
3	1	89	66	23	94	28.1	0.167	21	0
4	0	137	40	35	168	43.1	2.288	33	1

In [9]:
```
df.shape
```

Out[9]:
```
(768, 9)
```

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

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 768 entries, 0 to 767
Data columns (total 9 columns):
 #   Column                    Non-Null Count  Dtype  
---  ------                    --------------  -----  
 0   Pregnancies               768 non-null    int64  
 1   Glucose                   768 non-null    int64  
 2   BloodPressure             768 non-null    int64  
 3   SkinThickness             768 non-null    int64  
 4   Insulin                   768 non-null    int64  
 5   BMI                       768 non-null    float64
 6   DiabetesPedigreeFunction  768 non-null    float64
 7   Age                       768 non-null    int64  
 8   Outcome                   768 non-null    int64  
```

```
dtypes: float64(2), int64(7)
memory usage: 54.1 KB
```

In [11]:
```
df.describe()
```

Out[11]:

	Pregnancies	Glucose	BloodPressure	SkinThickness	Insulin	BMI	DiabetesPedigreeFunction	Age	Outcome
count	768.000000	768.000000	768.000000	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	0.471876	33.240885	0.348958
std	3.369578	31.972618	19.355807	15.952218	115.244002	7.884160	0.331329	11.760232	0.476951
min	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.078000	21.000000	0.000000
25%	1.000000	99.000000	62.000000	0.000000	0.000000	27.300000	0.243750	24.000000	0.000000
50%	3.000000	117.000000	72.000000	23.000000	30.500000	32.000000	0.372500	29.000000	0.000000
75%	6.000000	140.250000	80.000000	32.000000	127.250000	36.600000	0.626250	41.000000	1.000000
max	17.000000	199.000000	122.000000	99.000000	846.000000	67.100000	2.420000	81.000000	1.000000

In [12]:
```
#Checking for null values
df.isna().sum()
```

Out[12]:
```
Pregnancies                 0
Glucose                     0
BloodPressure               0
SkinThickness               0
Insulin                     0
BMI                         0
DiabetesPedigreeFunction    0
Age                         0
Outcome                     0
dtype: int64
```

Extract input and target features

In [13]:
```
x=df.iloc[:,:-1]
x.head()
```

Out[13]:

	Pregnancies	Glucose	BloodPressure	SkinThickness	Insulin	BMI	DiabetesPedigreeFunction	Age
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

In [14]:
```
y=df.iloc[:,-1]
y.head()
```

Out[14]:
```
0    1
1    0
2    1
3    0
4    1
Name: Outcome, dtype: int64
```

Train-Test splitting

In [40]:
```
from sklearn.model_selection import train_test_split
```

In [16]:
```
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.3)
```

In [17]:
```
x_train.head()
```

Out[17]:

	Pregnancies	Glucose	BloodPressure	SkinThickness	Insulin	BMI	DiabetesPedigreeFunction	Age
765	5	121	72	23	112	26.2	0.245	30
350	4	92	80	0	0	42.2	0.237	29
208	1	96	64	27	87	33.2	0.289	21
638	7	97	76	32	91	40.9	0.871	32

	Pregnancies	Glucose	BloodPressure	SkinThickness	Insulin	BMI	DiabetesPedigreeFunction	Age
621	2	92	76	20	0	24.2	1.698	28

In [18]:
```
y_train.head()
```

Out[18]:
```
765    0
350    0
208    0
638    1
621    0
Name: Outcome, dtype: int64
```

Normalization of input values

In [19]:
```
from sklearn.preprocessing import StandardScaler
```

In [20]:
```
scaler=StandardScaler()
scaler.fit(x_train)
x_train=scaler.transform(x_train)
x_test=scaler.transform(x_test)
```

In [21]:
```
x_train
```

Out[21]:
```
array([[ 0.32087331, -0.02224577,  0.13503557, ..., -0.72173529,
        -0.65749046, -0.30195314],
       [ 0.02632807, -0.93151964,  0.55540717, ...,  1.35049517,
         -0.6808989 , -0.38609887],
       [-0.85730766, -0.80610255, -0.28533603, ...,  0.18486553,
         -0.52874406, -1.05926476],
       ...,
       [-0.85730766, -0.68068547,  0.13503557, ..., -0.83829826,
          0.55097009, -0.47024461],
       [-1.1518529 ,  1.26327936,  0.34522137, ...,  2.30890175,
         -0.30928997, -0.63853608],
       [-1.1518529 , -0.33578848, -0.23278958, ..., -0.92895834,
          0.5568222 , -0.2178074 ]])
```

In [22]:
```
x_test
```

Out[22]:
```
array([[-0.56276241,  1.04379946, -0.91589343, ...,  0.89719475,
        -0.67212074, -0.72268182],
       [-0.56276241,  0.25994267,  1.39615038, ..., -1.18798715,
        -0.59019121, -1.05926476],
       [-0.26821717,  1.13786227, -0.28533603, ..., -0.07416328,
        -0.51118773, -0.80682755],
       ...,
       [ 0.02632807,  0.69890247,  0.66050007, ...,  0.87129187,
         0.24666041,  0.28706702],
       [ 0.90996379, -0.24172567, -0.28533603, ..., -0.56631801,
         0.76749813,  0.03462981],
       [ 0.61541855,  1.92171905,  1.29105747, ...,  1.169175  ,
         2.90059194,  0.96023291]])
```

Model Creation-Naive-bayes

In [23]:
```
from sklearn.naive_bayes import GaussianNB
```

In [24]:
```
model=GaussianNB()
model.fit(x_train,y_train)
```

Out[24]:
```
GaussianNB()
```

In [25]:
```
y_pred=model.predict(x_test)
y_pred
```

Out[25]:
```
array([1, 0, 1, 0, 0, 1, 0, 1, 1, 0, 1, 0, 0, 0, 0, 1, 0, 1, 0, 0, 0, 0,
       0, 1, 0, 1, 1, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 1, 0, 0,
       0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 1, 1, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0,
       1, 0, 0, 0, 0, 1, 1, 0, 0, 0, 1, 0, 0, 1, 0, 1, 1, 0, 0, 0, 0, 0,
       0, 0, 0, 1, 0, 0, 1, 1, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
       0, 0, 1, 0, 1, 0, 1, 0, 0, 1, 0, 1, 1, 0, 0, 1, 1, 0, 0, 0, 1, 0,
       1, 0, 0, 0, 0, 1, 1, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0,
       1, 0, 1, 0, 0, 0, 0, 1, 0, 0, 0, 0, 1, 1, 1, 0, 0, 0, 0, 1, 0, 0,
       1, 0, 1, 0, 1, 0, 0, 0, 1, 0, 0, 1, 0, 0, 0, 0, 0, 0, 1, 0, 1, 0,
```

```
       1, 0, 0, 0, 0, 0, 0, 1, 1, 1, 0, 1, 1, 0, 0, 0, 0, 0, 0, 1, 0, 0,
       0, 0, 0, 0, 1, 1, 0, 1, 1, 0, 1], dtype=int64)
```

In [26]:
```
from sklearn.metrics import classification_report,accuracy_score,confusion_matrix,ConfusionMatrixDisplay
```

In [27]:
```
score=accuracy_score(y_test,y_pred)
score
```

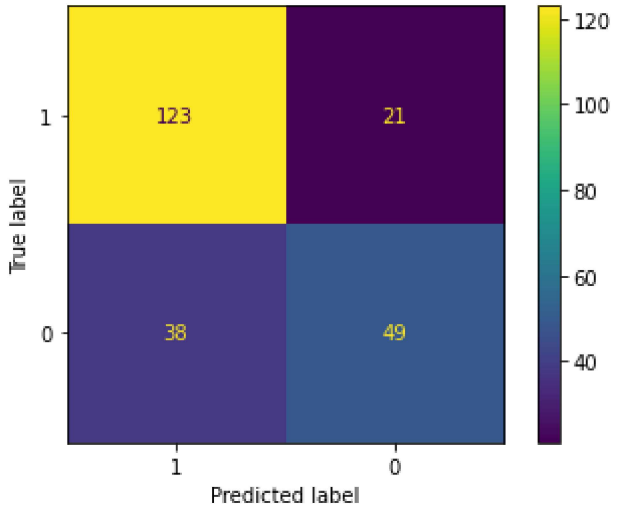
Out[27]:
```
0.7445887445887446
```

In [28]:
```
cm=confusion_matrix(y_test,y_pred)
cm
```

Out[28]:
```
array([[123,  21],
       [ 38,  49]], dtype=int64)
```

In [29]:
```
cmd=ConfusionMatrixDisplay(cm,display_labels=['1','0'])
cmd.plot()
```

Out[29]:
```
<sklearn.metrics._plot.confusion_matrix.ConfusionMatrixDisplay at 0x190d03f23d0>
```



In [30]:
```
nb_cr=classification_report(y_test,y_pred)
print(nb_cr)
```

```
              precision    recall  f1-score   support

           0       0.76      0.85      0.81       144
           1       0.70      0.56      0.62        87

    accuracy                           0.74       231
   macro avg       0.73      0.71      0.72       231
weighted avg       0.74      0.74      0.74       231
```

Model Creation-KNN

In [31]:
```
from sklearn.neighbors import KNeighborsClassifier
```

In [33]:
```
knn_model=KNeighborsClassifier(n_neighbors=5)
knn_model.fit(x_train,y_train)
```

Out[33]:
```
KNeighborsClassifier()
```

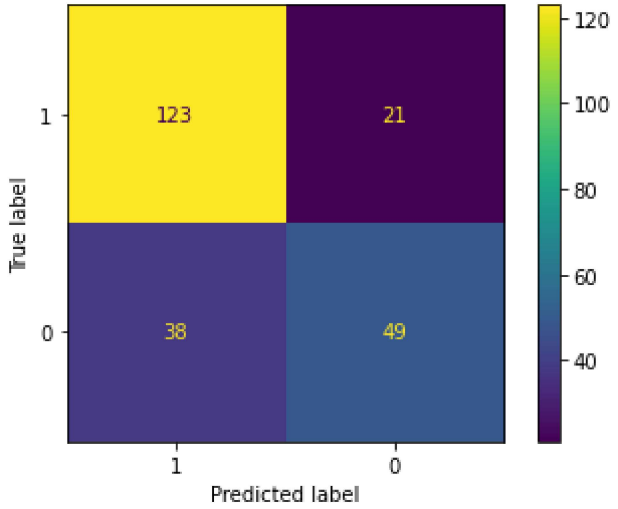
In [34]:
```
knn_model.predict(x_test)
```

Out[34]:
```
array([1, 0, 0, 0, 0, 1, 0, 1, 1, 0, 1, 0, 0, 0, 0, 1, 0, 1, 0, 0, 0, 0,
       0, 1, 0, 0, 0, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0,
       0, 0, 0, 0, 0, 1, 0, 1, 0, 0, 1, 1, 0, 0, 0, 0, 1, 0, 0, 1, 0, 0,
       1, 0, 0, 0, 0, 1, 0, 0, 0, 0, 1, 0, 0, 1, 0, 1, 1, 0, 0, 0, 0, 0,
       0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 1, 0, 0, 0, 1, 0, 0, 0, 0,
       0, 0, 1, 0, 1, 0, 0, 0, 0, 1, 0, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0,
       0, 0, 0, 0, 0, 1, 1, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0,
       1, 1, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 1, 1, 0, 0, 0, 1, 0, 0,
       1, 0, 1, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 1, 1,
       1, 0, 0, 0, 0, 0, 0, 1, 1, 1, 0, 1, 0, 0, 1, 0, 0, 0, 0, 1, 0, 1,
       1, 0, 0, 0, 1, 1, 0, 0, 0, 0, 1], dtype=int64)
```

In [36]:
```
score=accuracy_score(y_test,y_pred)
score
```

Out[36]:
```
0.7445887445887446
```

In [38]:
```
knn_cmd=ConfusionMatrixDisplay(confusion_matrix(y_test,y_pred),display_labels=[1,0])
knn_cmd.plot();
```



In [39]:
```
knn_cr=classification_report(y_test,y_pred)
print(knn_cr)
```

```
              precision    recall  f1-score   support

           0       0.76      0.85      0.81       144
           1       0.70      0.56      0.62        87

    accuracy                           0.74       231
   macro avg       0.73      0.71      0.72       231
weighted avg       0.74      0.74      0.74       231
```

In [ ]: