In [206…

```
'''
Patrick Ballou
ID: 801130521
ECGR 4105
Homework 2
Problem 1
'''
```

Out[206]:

```
'\nPatrick Ballou\nID: 801130521\nECGR 4105\nHomework 2\nProblem 1\n'
```

In [207…

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.linear_model import LogisticRegression
from sklearn.model_selection import train_test_split
from sklearn import metrics
from sklearn.preprocessing import MinMaxScaler, StandardScaler
```

In [208…

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

Out[208]:

| | 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 [209…

```
#train/test split, random_state functions as seed
df_train, df_test = train_test_split(df, train_size=.8, test_size=.2, random_state=7)
```

In [210…

```
#separate dataset into x and y, train and test
inputs = ['Pregnancies', 'Glucose', 'BloodPressure', 'SkinThickness', 'Insulin', 'BMI'

x_train = df_train[inputs]
Y_train = df_train['Outcome']

x_test = df_test[inputs]
Y_test = df_test['Outcome']
```

In [211…

```
#standard scaler performs best
scaler = StandardScaler()
#scaler = MinMaxScaler()
X_train = scaler.fit_transform(x_train)
X_test = scaler.fit_transform(x_test)
```

In [212…

```
#for loop finds best C value, which is the default in this case
'''
C = [10, 1, .1, .01, .001]
```

```
for c in C:
    classifier = LogisticRegression(random_state=7, C=c)
    classifier.fit(X_train, Y_train)
    print("C:", c)
    print("Training accuracy:", classifier.score(X_train, Y_train))
    print("Testing accuracy:", classifier.score(X_test, Y_test))

'''
classifier = LogisticRegression(random_state=7)
classifier.fit(X_train, Y_train)
```

Out[212]:

```
▾ LogisticRegression
LogisticRegression(random_state=7)
```

In [213…

```
Y_pred = classifier.predict(X_test)
```

In [214…

```
cnf_matrix = metrics.confusion_matrix(Y_test, Y_pred)
cnf_matrix
```

Out[214]:

```
array([[89,  8],
       [25, 32]], dtype=int64)
```

In [215…

```
print("Accuracy:", metrics.accuracy_score(Y_test, Y_pred))
print("Precision:", metrics.precision_score(Y_test, Y_pred))
print("Recall:", metrics.recall_score(Y_test, Y_pred))
```

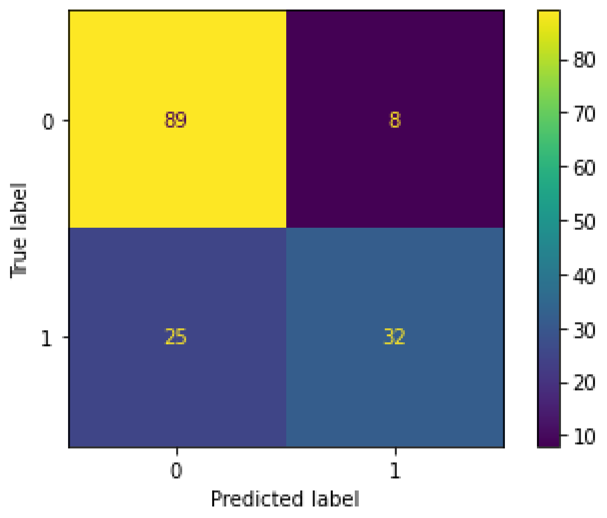
```
Accuracy: 0.7857142857142857
Precision: 0.8
Recall: 0.5614035087719298
```

In [216…

```
#not a great classifier
cm_display = metrics.ConfusionMatrixDisplay(confusion_matrix=cnf_matrix, display_label
cm_display.plot()
```

Out[216]:

```
<sklearn.metrics._plot.confusion_matrix.ConfusionMatrixDisplay at 0x1cf4c777df0>
```


True label
Predicted label