```
import numpy as np
import pandas as pd
from sklearn.metrics import confusion_matrix
from sklearn.model_selection import train_test_split
from sklearn.tree import DecisionTreeClassifier
from sklearn.metrics import accuracy_score
from sklearn.metrics import classification_report
def importdata():
  balance_data=pd.read_csv('https://archive.ics.uci.edu/ml/machine-learning-'+
                           'databases/balance-scale/balance-scale.data',sep=',',header=None)
  print("Dataset Length:",len(balance_data))
  print("Dataset Shape:",balance_data.shape)
  print("Dataset:",balance_data.head())
  return balance_data
def splitdataset(balance_data):
  x=balance_data.values[:,1:5]
  y=balance_data.values[:,0]
  x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.3,random_state=100)
  return x,y,x_train,x_test,y_train,y_test
def train_using_gini(X_train,X_test,y_train):
  clf_gini=DecisionTreeClassifier(criterion ="gini",random_state=100,max_depth=3,min_samples_leaf=5)
  clf_gini.fit(X_train, y_train)
  return clf_gini
def train_using_entropy(X_train,X_test,y_train):
  clf_entropy=DecisionTreeClassifier(criterion ="entropy",random_state=100,max_depth=3,min_samples_leaf=5)
  clf_entropy.fit(X_train, y_train)
  return clf_entropy
def prediction(X_test,clf_object):
  y_pred = clf_object.predict(X_test)
  print("Predicted values:")
  print(y_pred)
  return y_pred
def cal_accuracy(y_test,y_pred):
  print("confusion Matrix:",confusion_matrix(y_test,y_pred))
  print("Accuracy:",accuracy_score(y_test,y_pred)*100)
  print("Report:",classification_report(y_test,y_pred))
def main():
  data=importdata()
  x,y,x_train,x_test,y_train,y_test=splitdataset(data)
  clf_gini=train_using_gini(x_train,x_test,y_train)
  clf_entropy=train_using_entropy(x_train,x_test,y_train)
  print("Results Using Gini Index:")
  y_pred_gini=prediction(x_test, clf_gini)
  cal_accuracy(y_test,y_pred_gini)
  print("Results Using Entropy:")
  y_pred_entropy=prediction(x_test,clf_entropy)
  cal_accuracy(y_test,y_pred_entropy)
if __name__=="__main__":
  main()
```

```
Dataset Length: 625
Dataset Shape: (625, 5)
Dataset:    0  1  2  3  4
0  B  1  1  1  1
1  R  1  1  1  2
2  R  1  1  1  3
3  R  1  1  1  4
4  R  1  1  1  5
Results Using Gini Index:
Predicted values:
['R' 'L' 'R' 'R' 'R' 'L' 'R' 'L' 'L' 'L' 'R' 'L' 'L' 'L' 'R' 'L' 'R' 'L'
 'L' 'R' 'L' 'R' 'L' 'L' 'R' 'L' 'L' 'L' 'R' 'L' 'L' 'L' 'R' 'L' 'L' 'L'
 'L' 'R' 'L' 'L' 'R' 'L' 'R' 'L' 'L' 'R' 'R' 'L' 'L' 'R' 'L' 'R' 'R' 'L' 'R'
 'R' 'L' 'R' 'R' 'L' 'L' 'R' 'R' 'L' 'L' 'L' 'L' 'L' 'R' 'R' 'L' 'L' 'R'
 'R' 'L' 'R' 'L' 'R' 'R' 'R' 'L' 'R' 'L' 'L' 'L' 'L' 'R' 'R' 'L' 'R' 'L'
 'R' 'R' 'L' 'L' 'L' 'R' 'R' 'L' 'L' 'L' 'R' 'L' 'R' 'R' 'R' 'R' 'R' 'R'
 'R' 'L' 'R' 'L' 'R' 'R' 'L' 'R' 'R' 'R' 'R' 'R' 'L' 'R' 'L' 'L' 'L' 'L'
 'L' 'L' 'L' 'R' 'R' 'R' 'R' 'L' 'R' 'R' 'R' 'L' 'L' 'R' 'L' 'R' 'L' 'R'
 'L' 'L' 'R' 'L' 'L' 'R' 'L' 'R' 'L' 'R' 'R' 'R' 'L' 'R' 'R' 'R' 'R' 'R'
 'L' 'L' 'R' 'R' 'R' 'R' 'L' 'R' 'R' 'R' 'L' 'R' 'L' 'L' 'L' 'L' 'R' 'R'
 'L' 'R' 'R' 'L' 'L' 'R' 'R' 'R']
confusion Matrix: [[ 0  6  7]
 [ 0 67 18]
 [ 0 19 71]]
Accuracy: 73.40425531914893
Report:               precision    recall  f1-score   support

           B       0.00      0.00      0.00        13
           L       0.73      0.79      0.76        85
           R       0.74      0.79      0.76        90
```

```
    accuracy                           0.73       188
   macro avg       0.49      0.53      0.51       188
weighted avg       0.68      0.73      0.71       188

Results Using Entropy:
Predicted values:
['R' 'L' 'R' 'L' 'R' 'L' 'R' 'L' 'R' 'R' 'R' 'R' 'L' 'L' 'R' 'L' 'R' 'L'
 'L' 'R' 'L' 'R' 'L' 'L' 'R' 'L' 'R' 'L' 'R' 'L' 'R' 'L' 'R' 'L' 'L' 'L'
 'L' 'L' 'R' 'L' 'R' 'L' 'R' 'L' 'R' 'R' 'L' 'L' 'R' 'L' 'L' 'R' 'L' 'L'
 'R' 'L' 'R' 'R' 'L' 'R' 'R' 'R' 'L' 'L' 'R' 'L' 'L' 'R' 'L' 'L' 'L' 'R'
 'R' 'L' 'R' 'L' 'R' 'R' 'R' 'L' 'R' 'L' 'L' 'L' 'L' 'R' 'R' 'L' 'R' 'L'
 'R' 'R' 'L' 'L' 'L' 'R' 'R' 'L' 'L' 'L' 'R' 'L' 'L' 'R' 'R' 'R' 'R' 'R'
 'R' 'L' 'R' 'L' 'R' 'R' 'L' 'R' 'R' 'L' 'R' 'R' 'L' 'R' 'R' 'R' 'L' 'L'
 'L' 'L' 'L' 'R' 'R' 'R' 'R' 'L' 'R' 'R' 'R' 'L' 'L' 'R' 'L' 'R' 'L' 'R'
 'L' 'R' 'R' 'L' 'L' 'R' 'L' 'R' 'R' 'R' 'R' 'R' 'L' 'R' 'R' 'R' 'R' 'R'
 'R' 'L' 'R' 'L' 'R' 'R' 'L' 'R' 'L' 'R' 'L' 'R' 'L' 'L' 'L' 'L' 'L' 'R'
 'R' 'R' 'L' 'L' 'L' 'R' 'R' 'R']
confusion Matrix: [[ 0  6  7]
 [ 0 63 22]
 [ 0 20 70]]
Accuracy: 70.74468085106383
Report:               precision    recall  f1-score   support

           B       0.00      0.00      0.00        13
           L       0.71      0.74      0.72        85
```