

Task 4

```
In [2]: #Importing python libraries for plotting graphs and some mathematical computation.  
import numpy as np  
from matplotlib import pyplot as plt  
import sys
```

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In [3]: # Generating Linearly Separable data and considering it as a training data

data_points = np.random.randn(50,2) #50 randomly generated data points with
# pseudorandom number generator

y=[] # creating class-label
for i in range(50):
    y.append(0) # initializing class-label as 0

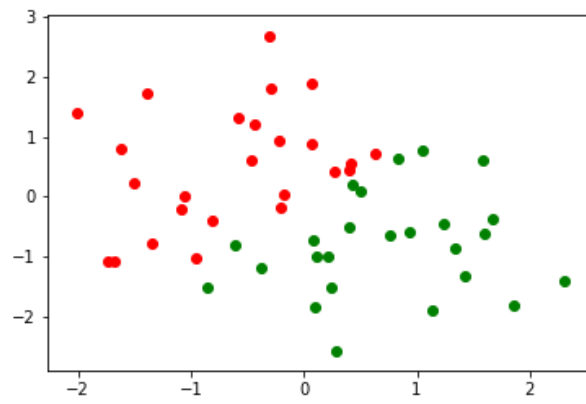
# I have considered the line  $10x+10y=1$  for separating the randomly generated
data points

for i in range(len(data_points)):
    if (10*data_points[i,0] - 1) < (10*data_points[i,1]):
        plt.scatter(data_points[i,0],data_points[i,1],c='r')
        y[i]=0 # red-points are labelled as 0
    else:
        plt.scatter(data_points[i,0],data_points[i,1],c='g')
        y[i]=1 # green-points are labelled as 1

plt.show()
data = [] #defining data matrix as input for features  $x_0$ (bias),  $x_1$ ,  $x_2$ 

Bias=1 # assuming value of bias as 1

for i in range(50):
    temp=[]
    temp.append(Bias) #appending bias
    temp.append(data_points[i,0]) #appending value of  $x_1$ 
    temp.append(data_points[i,1]) #appending value of  $x_2$ 
    temp.append(y[i])#appending trained class-label
    data.append(temp)
for i in range(50):
    print("our dataset is:")
    print(data[i])
```



```
our dataset is:
[1, -0.2002604949847506, -0.19410752023127514, 0]
our dataset is:
[1, 0.2149430587296218, -0.9990748040790678, 1]
our dataset is:
[1, 1.6677388633828238, -0.38038626390106794, 1]
our dataset is:
[1, -1.390683119523067, 1.7328107000873414, 0]
our dataset is:
[1, 2.311807683569437, -1.4031143022827197, 1]
our dataset is:
[1, -0.2924335319341218, 1.7986617603498078, 0]
our dataset is:
[1, 0.4008529284542809, -0.5070788530950642, 1]
our dataset is:
[1, 1.5885184873504667, 0.5980387977372332, 1]
our dataset is:
[1, -0.8151385782979127, -0.3990601784262513, 0]
our dataset is:
[1, 0.07223435395015969, 0.8764788568438642, 0]
our dataset is:
[1, -2.0132104454174398, 1.3991298501627336, 0]
our dataset is:
[1, -0.4396758153309532, 1.1936344815795394, 0]
our dataset is:
[1, 1.6034921024415716, -0.628941313187865, 1]
our dataset is:
[1, 0.8407374355050694, 0.6439721705599664, 1]
our dataset is:
[1, 0.9345105157420969, -0.5918628287010212, 1]
our dataset is:
[1, 0.28247873751398495, -2.57864202269858, 1]
our dataset is:
[1, 0.5034636989977452, 0.09752577503078931, 1]
our dataset is:
[1, -0.213795454483517, 0.942977646477042, 0]
our dataset is:
[1, -0.5786486862500015, 1.3173387077934458, 0]
our dataset is:
[1, -0.6035510933725458, -0.8124334355973999, 1]
our dataset is:
[1, -0.3828571017450127, -1.197184764917128, 1]
our dataset is:
[1, -0.9537180807059166, -1.0231956765871746, 0]
our dataset is:
[1, 0.10727859498500819, -1.0043206859559464, 1]
our dataset is:
[1, 0.23958034602167255, -1.5248899028372, 1]
```

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In [4]: # Implementing the single layer perceptron model

weights=[0.20,1.00,-1.00] # initializing weights

def predict(inputs,weights): # This function takes values of features (x0,x1,x2)

    #one by one from dataset and weight vector as input and return the value according
    #to the definition of standard sigmoid function

    threshold = 0.0 # I have set the threshold as 0
    v = 0.0
    for input,weight in zip(inputs,weights):
        v += input*weight
    return 1 if v >= threshold else 0.0

def accuracy(matrix,weights): # This function gives the accuracy on the scale of 0 to 1
    # in terms of how many points are correctly out of total number of data points

    num_correct=0.0 #initialized total correct points as 0
    preds=[]
    for i in range(len(matrix)):
        pred=predict(matrix[i][: -1],weights)
        preds.append(pred)
        if pred==matrix[i][-1]: num_correct += 1.0 #if data point is correctly classified then number of
            #correctly classified points are added by 1

    print("Predictions:",preds)
    return num_correct/float(len(matrix))

def train_weights(matrix,weights,iterations=1000,l_rate=1.0): # This function is to train weights
    #According to perceptron convergence theorem, after number of iterations, maximum accuracy will be reached
    # and after that weight vector will not be changed. Since, generated data is of random numbers.
    #So, each time when we run the cell, dataset will be different and so, number of iterations
    #to get the estimated weight vector with accuracy 1.0 will be different and so accordingly you can change
    # the value of number of iterations.
    for epoch in range(iterations):
        cur_acc=accuracy(matrix,weights)
        print("\nIteration %d \nWeights: " %epoch,weights)
        print("Accuracy: ", cur_acc )
        if cur_acc==1.0 and True : break

        for i in range(len(matrix)):
            prediction = predict(matrix[i][: -1],weights)
            error = matrix[i][-1] - prediction #to get the difference between predicted and actual class-label

            if True:
                print("Training on data at index %d..." %i)
                for j in range(len(weights)):
                    if True:
                        sys.stdout.write("\t Weight[%d]: %0.5f ---> " % (j,weights[j]))
                        weights[j]= weights[j] + (l_rate*error*matrix[i][j]) # weight is modified
                    #according to the definition
                    if True: sys.stdout.write("%0.5f\n" %weights[j])

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c) print("\n Final estimated weight vector with accuracy %0.5f is:"%cur_ac  
    return weights
```

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In [5]: train_weights(data, weights=weights, iterations=1000, l_rate=1.0)
```

```
Predictions: [1, 1, 1, 0.0, 1, 0.0, 1, 1, 0.0, 0.0, 0.0, 0.0, 1, 1, 1, 1, 1,
0.0, 0.0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0.0, 0.0, 1, 0.0, 0.0, 1, 0.0, 1, 0.
0, 1, 1, 0.0, 0.0, 0.0, 1, 1, 0.0, 0.0, 1, 1, 1]
```

```
Iteration 0
Weights: [0.2, 1.0, -1.0]
Accuracy: 0.88
Training on data at index 0...
  Weight[0]: 0.20000 ---> -0.80000
  Weight[1]: 1.00000 ---> 1.20026
  Weight[2]: -1.00000 ---> -0.80589
Training on data at index 1...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 1.20026 ---> 1.20026
  Weight[2]: -0.80589 ---> -0.80589
Training on data at index 2...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 1.20026 ---> 1.20026
  Weight[2]: -0.80589 ---> -0.80589
Training on data at index 3...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 1.20026 ---> 1.20026
  Weight[2]: -0.80589 ---> -0.80589
Training on data at index 4...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 1.20026 ---> 1.20026
  Weight[2]: -0.80589 ---> -0.80589
Training on data at index 5...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 1.20026 ---> 1.20026
  Weight[2]: -0.80589 ---> -0.80589
Training on data at index 6...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 1.20026 ---> 1.20026
  Weight[2]: -0.80589 ---> -0.80589
Training on data at index 7...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 1.20026 ---> 1.20026
  Weight[2]: -0.80589 ---> -0.80589
Training on data at index 8...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 1.20026 ---> 1.20026
  Weight[2]: -0.80589 ---> -0.80589
Training on data at index 9...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 1.20026 ---> 1.20026
  Weight[2]: -0.80589 ---> -0.80589
Training on data at index 10...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 1.20026 ---> 1.20026
  Weight[2]: -0.80589 ---> -0.80589
Training on data at index 11...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 1.20026 ---> 1.20026
  Weight[2]: -0.80589 ---> -0.80589
Training on data at index 12...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 1.20026 ---> 1.20026
  Weight[2]: -0.80589 ---> -0.80589
Training on data at index 13...
  Weight[0]: -0.80000 ---> 0.20000
  Weight[1]: 1.20026 ---> 2.04100
  Weight[2]: -0.80589 ---> -0.16192
Training on data at index 14...
  Weight[0]: 0.20000 ---> 0.20000
  Weight[1]: 2.04100 ---> 2.04100
  Weight[2]: -0.16192 ---> -0.16192
Training on data at index 15...
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Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 2.04100 ---> 2.04100
Weight[2]: -0.16192 ---> -0.16192
Training on data at index 16...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 2.04100 ---> 2.04100
Weight[2]: -0.16192 ---> -0.16192
Training on data at index 17...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 2.04100 ---> 2.04100
Weight[2]: -0.16192 ---> -0.16192
Training on data at index 18...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 2.04100 ---> 2.04100
Weight[2]: -0.16192 ---> -0.16192
Training on data at index 19...
Weight[0]: 0.20000 ---> 1.20000
Weight[1]: 2.04100 ---> 1.43745
Weight[2]: -0.16192 ---> -0.97435
Training on data at index 20...
Weight[0]: 1.20000 ---> 1.20000
Weight[1]: 1.43745 ---> 1.43745
Weight[2]: -0.97435 ---> -0.97435
Training on data at index 21...
Weight[0]: 1.20000 ---> 0.20000
Weight[1]: 1.43745 ---> 2.39116
Weight[2]: -0.97435 ---> 0.04884
Training on data at index 22...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 2.39116 ---> 2.39116
Weight[2]: 0.04884 ---> 0.04884
Training on data at index 23...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 2.39116 ---> 2.39116
Weight[2]: 0.04884 ---> 0.04884
Training on data at index 24...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 2.39116 ---> 2.39116
Weight[2]: 0.04884 ---> 0.04884
Training on data at index 25...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 2.39116 ---> 2.39116
Weight[2]: 0.04884 ---> 0.04884
Training on data at index 26...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 2.39116 ---> 2.39116
Weight[2]: 0.04884 ---> 0.04884
Training on data at index 27...
Weight[0]: 0.20000 ---> 1.20000
Weight[1]: 2.39116 ---> 1.54245
Weight[2]: 0.04884 ---> -1.45533
Training on data at index 28...
Weight[0]: 1.20000 ---> 1.20000
Weight[1]: 1.54245 ---> 1.54245
Weight[2]: -1.45533 ---> -1.45533
Training on data at index 29...
Weight[0]: 1.20000 ---> 0.20000
Weight[1]: 1.54245 ---> 2.89426
Weight[2]: -1.45533 ---> -0.68753
Training on data at index 30...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 2.89426 ---> 2.89426
Weight[2]: -0.68753 ---> -0.68753
Training on data at index 31...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 2.89426 ---> 2.89426
Weight[2]: -0.68753 ---> -0.68753
Training on data at index 32...
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Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 2.89426 ---> 2.89426
Weight[2]: -0.68753 ---> -0.68753
Training on data at index 33...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 2.89426 ---> 2.89426
Weight[2]: -0.68753 ---> -0.68753
Training on data at index 34...
Weight[0]: 0.20000 ---> -0.80000
Weight[1]: 2.89426 ---> 2.62736
Weight[2]: -0.68753 ---> -1.09690
Training on data at index 35...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 2.62736 ---> 2.62736
Weight[2]: -1.09690 ---> -1.09690
Training on data at index 36...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 2.62736 ---> 2.62736
Weight[2]: -1.09690 ---> -1.09690
Training on data at index 37...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 2.62736 ---> 2.62736
Weight[2]: -1.09690 ---> -1.09690
Training on data at index 38...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 2.62736 ---> 2.62736
Weight[2]: -1.09690 ---> -1.09690
Training on data at index 39...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 2.62736 ---> 2.62736
Weight[2]: -1.09690 ---> -1.09690
Training on data at index 40...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 2.62736 ---> 2.62736
Weight[2]: -1.09690 ---> -1.09690
Training on data at index 41...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 2.62736 ---> 2.62736
Weight[2]: -1.09690 ---> -1.09690
Training on data at index 42...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 2.62736 ---> 2.62736
Weight[2]: -1.09690 ---> -1.09690
Training on data at index 43...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 2.62736 ---> 2.62736
Weight[2]: -1.09690 ---> -1.09690
Training on data at index 44...
Weight[0]: -0.80000 ---> -1.80000
Weight[1]: 2.62736 ---> 2.00030
Weight[2]: -1.09690 ---> -1.82557
Training on data at index 45...
Weight[0]: -1.80000 ---> -1.80000
Weight[1]: 2.00030 ---> 2.00030
Weight[2]: -1.82557 ---> -1.82557
Training on data at index 46...
Weight[0]: -1.80000 ---> -1.80000
Weight[1]: 2.00030 ---> 2.00030
Weight[2]: -1.82557 ---> -1.82557
Training on data at index 47...
Weight[0]: -1.80000 ---> -1.80000
Weight[1]: 2.00030 ---> 2.00030
Weight[2]: -1.82557 ---> -1.82557
Training on data at index 48...
Weight[0]: -1.80000 ---> -1.80000
Weight[1]: 2.00030 ---> 2.00030
Weight[2]: -1.82557 ---> -1.82557
Training on data at index 49...
```

```

Weight[0]: -1.80000 ---> -1.80000
Weight[1]: 2.00030 ---> 2.00030
Weight[2]: -1.82557 ---> -1.82557
Predictions: [0.0, 1, 1, 0.0, 1, 0.0, 0.0, 1, 0.0, 0.0, 0.0, 0.0, 1, 0.0, 1,
1, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 1, 1, 0.0, 1, 0.0, 0.0, 1, 0.0, 0.0, 0.0, 0.
0, 0.0, 0.0, 0.0, 1, 0.0, 1, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 1, 1, 1]

```

```

Iteration 1
Weights: [-1.8, 2.0002964634652054, -1.82556765792775]
Accuracy: 0.82
Training on data at index 0...
Weight[0]: -1.80000 ---> -1.80000
Weight[1]: 2.00030 ---> 2.00030
Weight[2]: -1.82557 ---> -1.82557
Training on data at index 1...
Weight[0]: -1.80000 ---> -1.80000
Weight[1]: 2.00030 ---> 2.00030
Weight[2]: -1.82557 ---> -1.82557
Training on data at index 2...
Weight[0]: -1.80000 ---> -1.80000
Weight[1]: 2.00030 ---> 2.00030
Weight[2]: -1.82557 ---> -1.82557
Training on data at index 3...
Weight[0]: -1.80000 ---> -1.80000
Weight[1]: 2.00030 ---> 2.00030
Weight[2]: -1.82557 ---> -1.82557
Training on data at index 4...
Weight[0]: -1.80000 ---> -1.80000
Weight[1]: 2.00030 ---> 2.00030
Weight[2]: -1.82557 ---> -1.82557
Training on data at index 5...
Weight[0]: -1.80000 ---> -1.80000
Weight[1]: 2.00030 ---> 2.00030
Weight[2]: -1.82557 ---> -1.82557
Training on data at index 6...
Weight[0]: -1.80000 ---> -0.80000
Weight[1]: 2.00030 ---> 2.40115
Weight[2]: -1.82557 ---> -2.33265
Training on data at index 7...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 2.40115 ---> 2.40115
Weight[2]: -2.33265 ---> -2.33265
Training on data at index 8...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 2.40115 ---> 2.40115
Weight[2]: -2.33265 ---> -2.33265
Training on data at index 9...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 2.40115 ---> 2.40115
Weight[2]: -2.33265 ---> -2.33265
Training on data at index 10...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 2.40115 ---> 2.40115
Weight[2]: -2.33265 ---> -2.33265
Training on data at index 11...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 2.40115 ---> 2.40115
Weight[2]: -2.33265 ---> -2.33265
Training on data at index 12...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 2.40115 ---> 2.40115
Weight[2]: -2.33265 ---> -2.33265
Training on data at index 13...
Weight[0]: -0.80000 ---> 0.20000
Weight[1]: 2.40115 ---> 3.24189
Weight[2]: -2.33265 ---> -1.68867
Training on data at index 14...
Weight[0]: 0.20000 ---> 0.20000

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```
Weight[1]: 3.24189 ---> 3.24189
Weight[2]: -1.68867 ---> -1.68867
Training on data at index 15...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 3.24189 ---> 3.24189
Weight[2]: -1.68867 ---> -1.68867
Training on data at index 16...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 3.24189 ---> 3.24189
Weight[2]: -1.68867 ---> -1.68867
Training on data at index 17...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 3.24189 ---> 3.24189
Weight[2]: -1.68867 ---> -1.68867
Training on data at index 18...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 3.24189 ---> 3.24189
Weight[2]: -1.68867 ---> -1.68867
Training on data at index 19...
Weight[0]: 0.20000 ---> 1.20000
Weight[1]: 3.24189 ---> 2.63834
Weight[2]: -1.68867 ---> -2.50111
Training on data at index 20...
Weight[0]: 1.20000 ---> 1.20000
Weight[1]: 2.63834 ---> 2.63834
Weight[2]: -2.50111 ---> -2.50111
Training on data at index 21...
Weight[0]: 1.20000 ---> 0.20000
Weight[1]: 2.63834 ---> 3.59205
Weight[2]: -2.50111 ---> -1.47791
Training on data at index 22...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 3.59205 ---> 3.59205
Weight[2]: -1.47791 ---> -1.47791
Training on data at index 23...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 3.59205 ---> 3.59205
Weight[2]: -1.47791 ---> -1.47791
Training on data at index 24...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 3.59205 ---> 3.59205
Weight[2]: -1.47791 ---> -1.47791
Training on data at index 25...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 3.59205 ---> 3.59205
Weight[2]: -1.47791 ---> -1.47791
Training on data at index 26...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 3.59205 ---> 3.59205
Weight[2]: -1.47791 ---> -1.47791
Training on data at index 27...
Weight[0]: 0.20000 ---> 1.20000
Weight[1]: 3.59205 ---> 2.74334
Weight[2]: -1.47791 ---> -2.98208
Training on data at index 28...
Weight[0]: 1.20000 ---> 1.20000
Weight[1]: 2.74334 ---> 2.74334
Weight[2]: -2.98208 ---> -2.98208
Training on data at index 29...
Weight[0]: 1.20000 ---> 1.20000
Weight[1]: 2.74334 ---> 2.74334
Weight[2]: -2.98208 ---> -2.98208
Training on data at index 30...
Weight[0]: 1.20000 ---> 1.20000
Weight[1]: 2.74334 ---> 2.74334
Weight[2]: -2.98208 ---> -2.98208
Training on data at index 31...
Weight[0]: 1.20000 ---> 1.20000
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```
Weight[1]: 2.74334 ---> 2.74334
Weight[2]: -2.98208 ---> -2.98208
Training on data at index 32...
Weight[0]: 1.20000 ---> 1.20000
Weight[1]: 2.74334 ---> 2.74334
Weight[2]: -2.98208 ---> -2.98208
Training on data at index 33...
Weight[0]: 1.20000 ---> 1.20000
Weight[1]: 2.74334 ---> 2.74334
Weight[2]: -2.98208 ---> -2.98208
Training on data at index 34...
Weight[0]: 1.20000 ---> 0.20000
Weight[1]: 2.74334 ---> 2.47644
Weight[2]: -2.98208 ---> -3.39145
Training on data at index 35...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 2.47644 ---> 2.47644
Weight[2]: -3.39145 ---> -3.39145
Training on data at index 36...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 2.47644 ---> 2.47644
Weight[2]: -3.39145 ---> -3.39145
Training on data at index 37...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 2.47644 ---> 2.47644
Weight[2]: -3.39145 ---> -3.39145
Training on data at index 38...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 2.47644 ---> 2.47644
Weight[2]: -3.39145 ---> -3.39145
Training on data at index 39...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 2.47644 ---> 2.47644
Weight[2]: -3.39145 ---> -3.39145
Training on data at index 40...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 2.47644 ---> 2.47644
Weight[2]: -3.39145 ---> -3.39145
Training on data at index 41...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 2.47644 ---> 2.47644
Weight[2]: -3.39145 ---> -3.39145
Training on data at index 42...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 2.47644 ---> 2.47644
Weight[2]: -3.39145 ---> -3.39145
Training on data at index 43...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 2.47644 ---> 2.47644
Weight[2]: -3.39145 ---> -3.39145
Training on data at index 44...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 2.47644 ---> 2.47644
Weight[2]: -3.39145 ---> -3.39145
Training on data at index 45...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 2.47644 ---> 2.47644
Weight[2]: -3.39145 ---> -3.39145
Training on data at index 46...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 2.47644 ---> 2.47644
Weight[2]: -3.39145 ---> -3.39145
Training on data at index 47...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 2.47644 ---> 2.47644
Weight[2]: -3.39145 ---> -3.39145
Training on data at index 48...
Weight[0]: 0.20000 ---> 0.20000
```

```
Weight[1]: 2.47644 ---> 2.47644
Weight[2]: -3.39145 ---> -3.39145
Training on data at index 49...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 2.47644 ---> 2.47644
Weight[2]: -3.39145 ---> -3.39145
Predictions: [1, 1, 1, 0.0, 1, 0.0, 1, 1, 0.0, 0.0, 0.0, 0.0, 1, 1, 1, 1, 1,
0.0, 0.0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0.0, 0.0, 1, 0.0, 0.0, 0.0, 0.0, 1,
0.0, 1, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 1, 1, 1]

Iteration 2
Weights: [0.19999999999999996, 2.4764381698037257, -3.3914467031650806]
Accuracy: 0.96
Training on data at index 0...
Weight[0]: 0.20000 ---> -0.80000
Weight[1]: 2.47644 ---> 2.67670
Weight[2]: -3.39145 ---> -3.19734
Training on data at index 1...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 2.67670 ---> 2.67670
Weight[2]: -3.19734 ---> -3.19734
Training on data at index 2...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 2.67670 ---> 2.67670
Weight[2]: -3.19734 ---> -3.19734
Training on data at index 3...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 2.67670 ---> 2.67670
Weight[2]: -3.19734 ---> -3.19734
Training on data at index 4...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 2.67670 ---> 2.67670
Weight[2]: -3.19734 ---> -3.19734
Training on data at index 5...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 2.67670 ---> 2.67670
Weight[2]: -3.19734 ---> -3.19734
Training on data at index 6...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 2.67670 ---> 2.67670
Weight[2]: -3.19734 ---> -3.19734
Training on data at index 7...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 2.67670 ---> 2.67670
Weight[2]: -3.19734 ---> -3.19734
Training on data at index 8...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 2.67670 ---> 2.67670
Weight[2]: -3.19734 ---> -3.19734
Training on data at index 9...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 2.67670 ---> 2.67670
Weight[2]: -3.19734 ---> -3.19734
Training on data at index 10...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 2.67670 ---> 2.67670
Weight[2]: -3.19734 ---> -3.19734
Training on data at index 11...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 2.67670 ---> 2.67670
Weight[2]: -3.19734 ---> -3.19734
Training on data at index 12...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 2.67670 ---> 2.67670
Weight[2]: -3.19734 ---> -3.19734
Training on data at index 13...
Weight[0]: -0.80000 ---> 0.20000
Weight[1]: 2.67670 ---> 3.51744
```

```
Weight[2]: -3.19734 ---> -2.55337
Training on data at index 14...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 3.51744 ---> 3.51744
Weight[2]: -2.55337 ---> -2.55337
Training on data at index 15...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 3.51744 ---> 3.51744
Weight[2]: -2.55337 ---> -2.55337
Training on data at index 16...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 3.51744 ---> 3.51744
Weight[2]: -2.55337 ---> -2.55337
Training on data at index 17...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 3.51744 ---> 3.51744
Weight[2]: -2.55337 ---> -2.55337
Training on data at index 18...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 3.51744 ---> 3.51744
Weight[2]: -2.55337 ---> -2.55337
Training on data at index 19...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 3.51744 ---> 3.51744
Weight[2]: -2.55337 ---> -2.55337
Training on data at index 20...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 3.51744 ---> 3.51744
Weight[2]: -2.55337 ---> -2.55337
Training on data at index 21...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 3.51744 ---> 3.51744
Weight[2]: -2.55337 ---> -2.55337
Training on data at index 22...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 3.51744 ---> 3.51744
Weight[2]: -2.55337 ---> -2.55337
Training on data at index 23...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 3.51744 ---> 3.51744
Weight[2]: -2.55337 ---> -2.55337
Training on data at index 24...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 3.51744 ---> 3.51744
Weight[2]: -2.55337 ---> -2.55337
Training on data at index 25...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 3.51744 ---> 3.51744
Weight[2]: -2.55337 ---> -2.55337
Training on data at index 26...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 3.51744 ---> 3.51744
Weight[2]: -2.55337 ---> -2.55337
Training on data at index 27...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 3.51744 ---> 3.51744
Weight[2]: -2.55337 ---> -2.55337
Training on data at index 28...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 3.51744 ---> 3.51744
Weight[2]: -2.55337 ---> -2.55337
Training on data at index 29...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 3.51744 ---> 3.51744
Weight[2]: -2.55337 ---> -2.55337
Training on data at index 30...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 3.51744 ---> 3.51744
```

```
Weight[2]: -2.55337 ---> -2.55337
Training on data at index 31...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 3.51744 ---> 3.51744
Weight[2]: -2.55337 ---> -2.55337
Training on data at index 32...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 3.51744 ---> 3.51744
Weight[2]: -2.55337 ---> -2.55337
Training on data at index 33...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 3.51744 ---> 3.51744
Weight[2]: -2.55337 ---> -2.55337
Training on data at index 34...
Weight[0]: 0.20000 ---> -0.80000
Weight[1]: 3.51744 ---> 3.25054
Weight[2]: -2.55337 ---> -2.96273
Training on data at index 35...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 3.25054 ---> 3.25054
Weight[2]: -2.96273 ---> -2.96273
Training on data at index 36...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 3.25054 ---> 3.25054
Weight[2]: -2.96273 ---> -2.96273
Training on data at index 37...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 3.25054 ---> 3.25054
Weight[2]: -2.96273 ---> -2.96273
Training on data at index 38...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 3.25054 ---> 3.25054
Weight[2]: -2.96273 ---> -2.96273
Training on data at index 39...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 3.25054 ---> 3.25054
Weight[2]: -2.96273 ---> -2.96273
Training on data at index 40...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 3.25054 ---> 3.25054
Weight[2]: -2.96273 ---> -2.96273
Training on data at index 41...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 3.25054 ---> 3.25054
Weight[2]: -2.96273 ---> -2.96273
Training on data at index 42...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 3.25054 ---> 3.25054
Weight[2]: -2.96273 ---> -2.96273
Training on data at index 43...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 3.25054 ---> 3.25054
Weight[2]: -2.96273 ---> -2.96273
Training on data at index 44...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 3.25054 ---> 3.25054
Weight[2]: -2.96273 ---> -2.96273
Training on data at index 45...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 3.25054 ---> 3.25054
Weight[2]: -2.96273 ---> -2.96273
Training on data at index 46...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 3.25054 ---> 3.25054
Weight[2]: -2.96273 ---> -2.96273
Training on data at index 47...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 3.25054 ---> 3.25054
```



```

        Weight[2]: -2.96273 ---> -2.96273
Training on data at index 48...
        Weight[0]: -0.80000 ---> -0.80000
        Weight[1]: 3.25054 ---> 3.25054
        Weight[2]: -2.96273 ---> -2.96273
Training on data at index 49...
        Weight[0]: -0.80000 ---> -0.80000
        Weight[1]: 3.25054 ---> 3.25054
        Weight[2]: -2.96273 ---> -2.96273
Predictions: [0.0, 1, 1, 0.0, 1, 0.0, 1, 1, 0.0, 0.0, 0.0, 0.0, 1, 1, 1, 1,
1, 0.0, 0.0, 0.0, 1, 0.0, 1, 1, 1, 1, 1, 1, 0.0, 0.0, 1, 0.0, 0.0, 0.0, 0.
0, 1, 0.0, 1, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 1, 1, 1]

```

```

Iteration 3
Weights: [-0.8, 3.2505354852314756, -2.9627299569801915]
Accuracy: 0.98

```

```

Training on data at index 0...
        Weight[0]: -0.80000 ---> -0.80000
        Weight[1]: 3.25054 ---> 3.25054
        Weight[2]: -2.96273 ---> -2.96273
Training on data at index 1...
        Weight[0]: -0.80000 ---> -0.80000
        Weight[1]: 3.25054 ---> 3.25054
        Weight[2]: -2.96273 ---> -2.96273
Training on data at index 2...
        Weight[0]: -0.80000 ---> -0.80000
        Weight[1]: 3.25054 ---> 3.25054
        Weight[2]: -2.96273 ---> -2.96273
Training on data at index 3...
        Weight[0]: -0.80000 ---> -0.80000
        Weight[1]: 3.25054 ---> 3.25054
        Weight[2]: -2.96273 ---> -2.96273
Training on data at index 4...
        Weight[0]: -0.80000 ---> -0.80000
        Weight[1]: 3.25054 ---> 3.25054
        Weight[2]: -2.96273 ---> -2.96273
Training on data at index 5...
        Weight[0]: -0.80000 ---> -0.80000
        Weight[1]: 3.25054 ---> 3.25054
        Weight[2]: -2.96273 ---> -2.96273
Training on data at index 6...
        Weight[0]: -0.80000 ---> -0.80000
        Weight[1]: 3.25054 ---> 3.25054
        Weight[2]: -2.96273 ---> -2.96273
Training on data at index 7...
        Weight[0]: -0.80000 ---> -0.80000
        Weight[1]: 3.25054 ---> 3.25054
        Weight[2]: -2.96273 ---> -2.96273
Training on data at index 8...
        Weight[0]: -0.80000 ---> -0.80000
        Weight[1]: 3.25054 ---> 3.25054
        Weight[2]: -2.96273 ---> -2.96273
Training on data at index 9...
        Weight[0]: -0.80000 ---> -0.80000
        Weight[1]: 3.25054 ---> 3.25054
        Weight[2]: -2.96273 ---> -2.96273
Training on data at index 10...
        Weight[0]: -0.80000 ---> -0.80000
        Weight[1]: 3.25054 ---> 3.25054
        Weight[2]: -2.96273 ---> -2.96273
Training on data at index 11...
        Weight[0]: -0.80000 ---> -0.80000
        Weight[1]: 3.25054 ---> 3.25054
        Weight[2]: -2.96273 ---> -2.96273
Training on data at index 12...
        Weight[0]: -0.80000 ---> -0.80000
        Weight[1]: 3.25054 ---> 3.25054
        Weight[2]: -2.96273 ---> -2.96273

```

```
Training on data at index 13...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 3.25054 ---> 3.25054
  Weight[2]: -2.96273 ---> -2.96273
Training on data at index 14...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 3.25054 ---> 3.25054
  Weight[2]: -2.96273 ---> -2.96273
Training on data at index 15...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 3.25054 ---> 3.25054
  Weight[2]: -2.96273 ---> -2.96273
Training on data at index 16...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 3.25054 ---> 3.25054
  Weight[2]: -2.96273 ---> -2.96273
Training on data at index 17...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 3.25054 ---> 3.25054
  Weight[2]: -2.96273 ---> -2.96273
Training on data at index 18...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 3.25054 ---> 3.25054
  Weight[2]: -2.96273 ---> -2.96273
Training on data at index 19...
  Weight[0]: -0.80000 ---> 0.20000
  Weight[1]: 3.25054 ---> 2.64698
  Weight[2]: -2.96273 ---> -3.77516
Training on data at index 20...
  Weight[0]: 0.20000 ---> 0.20000
  Weight[1]: 2.64698 ---> 2.64698
  Weight[2]: -3.77516 ---> -3.77516
Training on data at index 21...
  Weight[0]: 0.20000 ---> -0.80000
  Weight[1]: 2.64698 ---> 3.60070
  Weight[2]: -3.77516 ---> -2.75197
Training on data at index 22...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 3.60070 ---> 3.60070
  Weight[2]: -2.75197 ---> -2.75197
Training on data at index 23...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 3.60070 ---> 3.60070
  Weight[2]: -2.75197 ---> -2.75197
Training on data at index 24...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 3.60070 ---> 3.60070
  Weight[2]: -2.75197 ---> -2.75197
Training on data at index 25...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 3.60070 ---> 3.60070
  Weight[2]: -2.75197 ---> -2.75197
Training on data at index 26...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 3.60070 ---> 3.60070
  Weight[2]: -2.75197 ---> -2.75197
Training on data at index 27...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 3.60070 ---> 3.60070
  Weight[2]: -2.75197 ---> -2.75197
Training on data at index 28...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 3.60070 ---> 3.60070
  Weight[2]: -2.75197 ---> -2.75197
Training on data at index 29...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 3.60070 ---> 3.60070
  Weight[2]: -2.75197 ---> -2.75197
```

```
Training on data at index 30...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 3.60070 ---> 3.60070
  Weight[2]: -2.75197 ---> -2.75197
Training on data at index 31...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 3.60070 ---> 3.60070
  Weight[2]: -2.75197 ---> -2.75197
Training on data at index 32...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 3.60070 ---> 3.60070
  Weight[2]: -2.75197 ---> -2.75197
Training on data at index 33...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 3.60070 ---> 3.60070
  Weight[2]: -2.75197 ---> -2.75197
Training on data at index 34...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 3.60070 ---> 3.60070
  Weight[2]: -2.75197 ---> -2.75197
Training on data at index 35...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 3.60070 ---> 3.60070
  Weight[2]: -2.75197 ---> -2.75197
Training on data at index 36...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 3.60070 ---> 3.60070
  Weight[2]: -2.75197 ---> -2.75197
Training on data at index 37...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 3.60070 ---> 3.60070
  Weight[2]: -2.75197 ---> -2.75197
Training on data at index 38...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 3.60070 ---> 3.60070
  Weight[2]: -2.75197 ---> -2.75197
Training on data at index 39...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 3.60070 ---> 3.60070
  Weight[2]: -2.75197 ---> -2.75197
Training on data at index 40...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 3.60070 ---> 3.60070
  Weight[2]: -2.75197 ---> -2.75197
Training on data at index 41...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 3.60070 ---> 3.60070
  Weight[2]: -2.75197 ---> -2.75197
Training on data at index 42...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 3.60070 ---> 3.60070
  Weight[2]: -2.75197 ---> -2.75197
Training on data at index 43...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 3.60070 ---> 3.60070
  Weight[2]: -2.75197 ---> -2.75197
Training on data at index 44...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 3.60070 ---> 3.60070
  Weight[2]: -2.75197 ---> -2.75197
Training on data at index 45...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 3.60070 ---> 3.60070
  Weight[2]: -2.75197 ---> -2.75197
Training on data at index 46...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 3.60070 ---> 3.60070
  Weight[2]: -2.75197 ---> -2.75197
```

```
Training on data at index 47...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 3.60070 ---> 3.60070
  Weight[2]: -2.75197 ---> -2.75197
Training on data at index 48...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 3.60070 ---> 3.60070
  Weight[2]: -2.75197 ---> -2.75197
Training on data at index 49...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 3.60070 ---> 3.60070
  Weight[2]: -2.75197 ---> -2.75197
Predictions: [0.0, 1, 1, 0.0, 1, 0.0, 1, 1, 0.0, 0.0, 0.0, 0.0, 1, 1, 1, 1,
1, 0.0, 0.0, 0.0, 1, 0.0, 1, 1, 1, 1, 1, 1, 0.0, 0.0, 1, 0.0, 0.0, 0.0, 0.
0, 1, 0.0, 1, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 1, 1, 1]
```

```
Iteration 4
Weights: [-0.8, 3.6007024725648464, -2.751967715990417]
Accuracy: 0.98
Training on data at index 0...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 3.60070 ---> 3.60070
  Weight[2]: -2.75197 ---> -2.75197
Training on data at index 1...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 3.60070 ---> 3.60070
  Weight[2]: -2.75197 ---> -2.75197
Training on data at index 2...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 3.60070 ---> 3.60070
  Weight[2]: -2.75197 ---> -2.75197
Training on data at index 3...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 3.60070 ---> 3.60070
  Weight[2]: -2.75197 ---> -2.75197
Training on data at index 4...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 3.60070 ---> 3.60070
  Weight[2]: -2.75197 ---> -2.75197
Training on data at index 5...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 3.60070 ---> 3.60070
  Weight[2]: -2.75197 ---> -2.75197
Training on data at index 6...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 3.60070 ---> 3.60070
  Weight[2]: -2.75197 ---> -2.75197
Training on data at index 7...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 3.60070 ---> 3.60070
  Weight[2]: -2.75197 ---> -2.75197
Training on data at index 8...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 3.60070 ---> 3.60070
  Weight[2]: -2.75197 ---> -2.75197
Training on data at index 9...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 3.60070 ---> 3.60070
  Weight[2]: -2.75197 ---> -2.75197
Training on data at index 10...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 3.60070 ---> 3.60070
  Weight[2]: -2.75197 ---> -2.75197
Training on data at index 11...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 3.60070 ---> 3.60070
  Weight[2]: -2.75197 ---> -2.75197
Training on data at index 12...
```

```
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 3.60070 ---> 3.60070
Weight[2]: -2.75197 ---> -2.75197
Training on data at index 13...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 3.60070 ---> 3.60070
Weight[2]: -2.75197 ---> -2.75197
Training on data at index 14...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 3.60070 ---> 3.60070
Weight[2]: -2.75197 ---> -2.75197
Training on data at index 15...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 3.60070 ---> 3.60070
Weight[2]: -2.75197 ---> -2.75197
Training on data at index 16...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 3.60070 ---> 3.60070
Weight[2]: -2.75197 ---> -2.75197
Training on data at index 17...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 3.60070 ---> 3.60070
Weight[2]: -2.75197 ---> -2.75197
Training on data at index 18...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 3.60070 ---> 3.60070
Weight[2]: -2.75197 ---> -2.75197
Training on data at index 19...
Weight[0]: -0.80000 ---> 0.20000
Weight[1]: 3.60070 ---> 2.99715
Weight[2]: -2.75197 ---> -3.56440
Training on data at index 20...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 2.99715 ---> 2.99715
Weight[2]: -3.56440 ---> -3.56440
Training on data at index 21...
Weight[0]: 0.20000 ---> -0.80000
Weight[1]: 2.99715 ---> 3.95087
Weight[2]: -3.56440 ---> -2.54121
Training on data at index 22...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 3.95087 ---> 3.95087
Weight[2]: -2.54121 ---> -2.54121
Training on data at index 23...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 3.95087 ---> 3.95087
Weight[2]: -2.54121 ---> -2.54121
Training on data at index 24...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 3.95087 ---> 3.95087
Weight[2]: -2.54121 ---> -2.54121
Training on data at index 25...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 3.95087 ---> 3.95087
Weight[2]: -2.54121 ---> -2.54121
Training on data at index 26...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 3.95087 ---> 3.95087
Weight[2]: -2.54121 ---> -2.54121
Training on data at index 27...
Weight[0]: -0.80000 ---> 0.20000
Weight[1]: 3.95087 ---> 3.10215
Weight[2]: -2.54121 ---> -4.04538
Training on data at index 28...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 3.10215 ---> 3.10215
Weight[2]: -4.04538 ---> -4.04538
Training on data at index 29...
```

```
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 3.10215 ---> 3.10215
Weight[2]: -4.04538 ---> -4.04538
Training on data at index 30...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 3.10215 ---> 3.10215
Weight[2]: -4.04538 ---> -4.04538
Training on data at index 31...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 3.10215 ---> 3.10215
Weight[2]: -4.04538 ---> -4.04538
Training on data at index 32...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 3.10215 ---> 3.10215
Weight[2]: -4.04538 ---> -4.04538
Training on data at index 33...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 3.10215 ---> 3.10215
Weight[2]: -4.04538 ---> -4.04538
Training on data at index 34...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 3.10215 ---> 3.10215
Weight[2]: -4.04538 ---> -4.04538
Training on data at index 35...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 3.10215 ---> 3.10215
Weight[2]: -4.04538 ---> -4.04538
Training on data at index 36...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 3.10215 ---> 3.10215
Weight[2]: -4.04538 ---> -4.04538
Training on data at index 37...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 3.10215 ---> 3.10215
Weight[2]: -4.04538 ---> -4.04538
Training on data at index 38...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 3.10215 ---> 3.10215
Weight[2]: -4.04538 ---> -4.04538
Training on data at index 39...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 3.10215 ---> 3.10215
Weight[2]: -4.04538 ---> -4.04538
Training on data at index 40...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 3.10215 ---> 3.10215
Weight[2]: -4.04538 ---> -4.04538
Training on data at index 41...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 3.10215 ---> 3.10215
Weight[2]: -4.04538 ---> -4.04538
Training on data at index 42...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 3.10215 ---> 3.10215
Weight[2]: -4.04538 ---> -4.04538
Training on data at index 43...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 3.10215 ---> 3.10215
Weight[2]: -4.04538 ---> -4.04538
Training on data at index 44...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 3.10215 ---> 3.10215
Weight[2]: -4.04538 ---> -4.04538
Training on data at index 45...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 3.10215 ---> 3.10215
Weight[2]: -4.04538 ---> -4.04538
Training on data at index 46...
```

```

Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 3.10215 ---> 3.10215
Weight[2]: -4.04538 ---> -4.04538
Training on data at index 47...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 3.10215 ---> 3.10215
Weight[2]: -4.04538 ---> -4.04538
Training on data at index 48...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 3.10215 ---> 3.10215
Weight[2]: -4.04538 ---> -4.04538
Training on data at index 49...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 3.10215 ---> 3.10215
Weight[2]: -4.04538 ---> -4.04538
Predictions: [1, 1, 1, 0.0, 1, 0.0, 1, 1, 0.0, 0.0, 0.0, 0.0, 1, 1, 1, 1, 1,
0.0, 0.0, 1, 1, 1, 1, 1, 1, 1, 1, 0.0, 0.0, 1, 0.0, 0.0, 0.0, 0.0, 1,
0.0, 1, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 1, 1, 1]

```

```

Iteration 5
Weights: [0.19999999999999996, 3.1021544300060873, -4.045377134086297]
Accuracy: 0.96

```

```

Training on data at index 0...
Weight[0]: 0.20000 ---> -0.80000
Weight[1]: 3.10215 ---> 3.30241
Weight[2]: -4.04538 ---> -3.85127
Training on data at index 1...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 3.30241 ---> 3.30241
Weight[2]: -3.85127 ---> -3.85127
Training on data at index 2...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 3.30241 ---> 3.30241
Weight[2]: -3.85127 ---> -3.85127
Training on data at index 3...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 3.30241 ---> 3.30241
Weight[2]: -3.85127 ---> -3.85127
Training on data at index 4...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 3.30241 ---> 3.30241
Weight[2]: -3.85127 ---> -3.85127
Training on data at index 5...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 3.30241 ---> 3.30241
Weight[2]: -3.85127 ---> -3.85127
Training on data at index 6...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 3.30241 ---> 3.30241
Weight[2]: -3.85127 ---> -3.85127
Training on data at index 7...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 3.30241 ---> 3.30241
Weight[2]: -3.85127 ---> -3.85127
Training on data at index 8...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 3.30241 ---> 3.30241
Weight[2]: -3.85127 ---> -3.85127
Training on data at index 9...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 3.30241 ---> 3.30241
Weight[2]: -3.85127 ---> -3.85127
Training on data at index 10...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 3.30241 ---> 3.30241
Weight[2]: -3.85127 ---> -3.85127
Training on data at index 11...
Weight[0]: -0.80000 ---> -0.80000

```

```
Weight[1]: 3.30241 ---> 3.30241
Weight[2]: -3.85127 ---> -3.85127
Training on data at index 12...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 3.30241 ---> 3.30241
Weight[2]: -3.85127 ---> -3.85127
Training on data at index 13...
Weight[0]: -0.80000 ---> 0.20000
Weight[1]: 3.30241 ---> 4.14315
Weight[2]: -3.85127 ---> -3.20730
Training on data at index 14...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 4.14315 ---> 4.14315
Weight[2]: -3.20730 ---> -3.20730
Training on data at index 15...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 4.14315 ---> 4.14315
Weight[2]: -3.20730 ---> -3.20730
Training on data at index 16...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 4.14315 ---> 4.14315
Weight[2]: -3.20730 ---> -3.20730
Training on data at index 17...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 4.14315 ---> 4.14315
Weight[2]: -3.20730 ---> -3.20730
Training on data at index 18...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 4.14315 ---> 4.14315
Weight[2]: -3.20730 ---> -3.20730
Training on data at index 19...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 4.14315 ---> 4.14315
Weight[2]: -3.20730 ---> -3.20730
Training on data at index 20...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 4.14315 ---> 4.14315
Weight[2]: -3.20730 ---> -3.20730
Training on data at index 21...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 4.14315 ---> 4.14315
Weight[2]: -3.20730 ---> -3.20730
Training on data at index 22...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 4.14315 ---> 4.14315
Weight[2]: -3.20730 ---> -3.20730
Training on data at index 23...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 4.14315 ---> 4.14315
Weight[2]: -3.20730 ---> -3.20730
Training on data at index 24...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 4.14315 ---> 4.14315
Weight[2]: -3.20730 ---> -3.20730
Training on data at index 25...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 4.14315 ---> 4.14315
Weight[2]: -3.20730 ---> -3.20730
Training on data at index 26...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 4.14315 ---> 4.14315
Weight[2]: -3.20730 ---> -3.20730
Training on data at index 27...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 4.14315 ---> 4.14315
Weight[2]: -3.20730 ---> -3.20730
Training on data at index 28...
Weight[0]: 0.20000 ---> 0.20000
```



```
Weight[1]: 4.14315 ---> 4.14315
Weight[2]: -3.20730 ---> -3.20730
Training on data at index 29...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 4.14315 ---> 4.14315
Weight[2]: -3.20730 ---> -3.20730
Training on data at index 30...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 4.14315 ---> 4.14315
Weight[2]: -3.20730 ---> -3.20730
Training on data at index 31...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 4.14315 ---> 4.14315
Weight[2]: -3.20730 ---> -3.20730
Training on data at index 32...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 4.14315 ---> 4.14315
Weight[2]: -3.20730 ---> -3.20730
Training on data at index 33...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 4.14315 ---> 4.14315
Weight[2]: -3.20730 ---> -3.20730
Training on data at index 34...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 4.14315 ---> 4.14315
Weight[2]: -3.20730 ---> -3.20730
Training on data at index 35...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 4.14315 ---> 4.14315
Weight[2]: -3.20730 ---> -3.20730
Training on data at index 36...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 4.14315 ---> 4.14315
Weight[2]: -3.20730 ---> -3.20730
Training on data at index 37...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 4.14315 ---> 4.14315
Weight[2]: -3.20730 ---> -3.20730
Training on data at index 38...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 4.14315 ---> 4.14315
Weight[2]: -3.20730 ---> -3.20730
Training on data at index 39...
Weight[0]: 0.20000 ---> -0.80000
Weight[1]: 4.14315 ---> 3.73075
Weight[2]: -3.20730 ---> -3.75811
Training on data at index 40...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 3.73075 ---> 3.73075
Weight[2]: -3.75811 ---> -3.75811
Training on data at index 41...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 3.73075 ---> 3.73075
Weight[2]: -3.75811 ---> -3.75811
Training on data at index 42...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 3.73075 ---> 3.73075
Weight[2]: -3.75811 ---> -3.75811
Training on data at index 43...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 3.73075 ---> 3.73075
Weight[2]: -3.75811 ---> -3.75811
Training on data at index 44...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 3.73075 ---> 3.73075
Weight[2]: -3.75811 ---> -3.75811
Training on data at index 45...
Weight[0]: -0.80000 ---> -0.80000
```

```

Weight[1]: 3.73075 ---> 3.73075
Weight[2]: -3.75811 ---> -3.75811
Training on data at index 46...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 3.73075 ---> 3.73075
Weight[2]: -3.75811 ---> -3.75811
Training on data at index 47...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 3.73075 ---> 3.73075
Weight[2]: -3.75811 ---> -3.75811
Training on data at index 48...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 3.73075 ---> 3.73075
Weight[2]: -3.75811 ---> -3.75811
Training on data at index 49...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 3.73075 ---> 3.73075
Weight[2]: -3.75811 ---> -3.75811
Predictions: [0.0, 1, 1, 0.0, 1, 0.0, 1, 1, 0.0, 0.0, 0.0, 0.0, 1, 0.0, 1, 1,
1, 0.0, 0.0, 1, 1, 0.0, 1, 1, 1, 1, 1, 1, 0.0, 0.0, 1, 0.0, 0.0, 0.0,
1, 0.0, 1, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 1, 1, 1]

```

```

Iteration 6
Weights: [-0.8, 3.730750553965469, -3.7581087019744035]
Accuracy: 0.98
Training on data at index 0...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 3.73075 ---> 3.73075
Weight[2]: -3.75811 ---> -3.75811
Training on data at index 1...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 3.73075 ---> 3.73075
Weight[2]: -3.75811 ---> -3.75811
Training on data at index 2...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 3.73075 ---> 3.73075
Weight[2]: -3.75811 ---> -3.75811
Training on data at index 3...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 3.73075 ---> 3.73075
Weight[2]: -3.75811 ---> -3.75811
Training on data at index 4...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 3.73075 ---> 3.73075
Weight[2]: -3.75811 ---> -3.75811
Training on data at index 5...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 3.73075 ---> 3.73075
Weight[2]: -3.75811 ---> -3.75811
Training on data at index 6...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 3.73075 ---> 3.73075
Weight[2]: -3.75811 ---> -3.75811
Training on data at index 7...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 3.73075 ---> 3.73075
Weight[2]: -3.75811 ---> -3.75811
Training on data at index 8...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 3.73075 ---> 3.73075
Weight[2]: -3.75811 ---> -3.75811
Training on data at index 9...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 3.73075 ---> 3.73075
Weight[2]: -3.75811 ---> -3.75811
Training on data at index 10...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 3.73075 ---> 3.73075

```

```
Weight[2]: -3.75811 ---> -3.75811
Training on data at index 11...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 3.73075 ---> 3.73075
Weight[2]: -3.75811 ---> -3.75811
Training on data at index 12...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 3.73075 ---> 3.73075
Weight[2]: -3.75811 ---> -3.75811
Training on data at index 13...
Weight[0]: -0.80000 ---> 0.20000
Weight[1]: 3.73075 ---> 4.57149
Weight[2]: -3.75811 ---> -3.11414
Training on data at index 14...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 4.57149 ---> 4.57149
Weight[2]: -3.11414 ---> -3.11414
Training on data at index 15...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 4.57149 ---> 4.57149
Weight[2]: -3.11414 ---> -3.11414
Training on data at index 16...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 4.57149 ---> 4.57149
Weight[2]: -3.11414 ---> -3.11414
Training on data at index 17...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 4.57149 ---> 4.57149
Weight[2]: -3.11414 ---> -3.11414
Training on data at index 18...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 4.57149 ---> 4.57149
Weight[2]: -3.11414 ---> -3.11414
Training on data at index 19...
Weight[0]: 0.20000 ---> 1.20000
Weight[1]: 4.57149 ---> 3.96794
Weight[2]: -3.11414 ---> -3.92657
Training on data at index 20...
Weight[0]: 1.20000 ---> 1.20000
Weight[1]: 3.96794 ---> 3.96794
Weight[2]: -3.92657 ---> -3.92657
Training on data at index 21...
Weight[0]: 1.20000 ---> 0.20000
Weight[1]: 3.96794 ---> 4.92165
Weight[2]: -3.92657 ---> -2.90337
Training on data at index 22...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 4.92165 ---> 4.92165
Weight[2]: -2.90337 ---> -2.90337
Training on data at index 23...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 4.92165 ---> 4.92165
Weight[2]: -2.90337 ---> -2.90337
Training on data at index 24...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 4.92165 ---> 4.92165
Weight[2]: -2.90337 ---> -2.90337
Training on data at index 25...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 4.92165 ---> 4.92165
Weight[2]: -2.90337 ---> -2.90337
Training on data at index 26...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 4.92165 ---> 4.92165
Weight[2]: -2.90337 ---> -2.90337
Training on data at index 27...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 4.92165 ---> 4.92165
```

```
Weight[2]: -2.90337 ---> -2.90337
Training on data at index 28...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 4.92165 ---> 4.92165
Weight[2]: -2.90337 ---> -2.90337
Training on data at index 29...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 4.92165 ---> 4.92165
Weight[2]: -2.90337 ---> -2.90337
Training on data at index 30...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 4.92165 ---> 4.92165
Weight[2]: -2.90337 ---> -2.90337
Training on data at index 31...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 4.92165 ---> 4.92165
Weight[2]: -2.90337 ---> -2.90337
Training on data at index 32...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 4.92165 ---> 4.92165
Weight[2]: -2.90337 ---> -2.90337
Training on data at index 33...
Weight[0]: 0.20000 ---> 0.20000
Weight[1]: 4.92165 ---> 4.92165
Weight[2]: -2.90337 ---> -2.90337
Training on data at index 34...
Weight[0]: 0.20000 ---> -0.80000
Weight[1]: 4.92165 ---> 4.65475
Weight[2]: -2.90337 ---> -3.31274
Training on data at index 35...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.65475 ---> 4.65475
Weight[2]: -3.31274 ---> -3.31274
Training on data at index 36...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.65475 ---> 4.65475
Weight[2]: -3.31274 ---> -3.31274
Training on data at index 37...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.65475 ---> 4.65475
Weight[2]: -3.31274 ---> -3.31274
Training on data at index 38...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.65475 ---> 4.65475
Weight[2]: -3.31274 ---> -3.31274
Training on data at index 39...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.65475 ---> 4.65475
Weight[2]: -3.31274 ---> -3.31274
Training on data at index 40...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.65475 ---> 4.65475
Weight[2]: -3.31274 ---> -3.31274
Training on data at index 41...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.65475 ---> 4.65475
Weight[2]: -3.31274 ---> -3.31274
Training on data at index 42...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.65475 ---> 4.65475
Weight[2]: -3.31274 ---> -3.31274
Training on data at index 43...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.65475 ---> 4.65475
Weight[2]: -3.31274 ---> -3.31274
Training on data at index 44...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.65475 ---> 4.65475
```

```

Weight[2]: -3.31274 ---> -3.31274
Training on data at index 45...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.65475 ---> 4.65475
Weight[2]: -3.31274 ---> -3.31274
Training on data at index 46...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.65475 ---> 4.65475
Weight[2]: -3.31274 ---> -3.31274
Training on data at index 47...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.65475 ---> 4.65475
Weight[2]: -3.31274 ---> -3.31274
Training on data at index 48...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.65475 ---> 4.65475
Weight[2]: -3.31274 ---> -3.31274
Training on data at index 49...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.65475 ---> 4.65475
Weight[2]: -3.31274 ---> -3.31274
Predictions: [0.0, 1, 1, 0.0, 1, 0.0, 1, 1, 0.0, 0.0, 0.0, 0.0, 1, 1, 1, 1,
1, 0.0, 0.0, 0.0, 1, 0.0, 1, 1, 1, 1, 1, 1, 0.0, 0.0, 1, 0.0, 0.0, 0.
0, 1, 0.0, 1, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 1, 1, 1]

```

```

Iteration 7
Weights: [-0.8, 4.65475436174184, -3.312737235031015]
Accuracy: 0.98
Training on data at index 0...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.65475 ---> 4.65475
Weight[2]: -3.31274 ---> -3.31274
Training on data at index 1...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.65475 ---> 4.65475
Weight[2]: -3.31274 ---> -3.31274
Training on data at index 2...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.65475 ---> 4.65475
Weight[2]: -3.31274 ---> -3.31274
Training on data at index 3...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.65475 ---> 4.65475
Weight[2]: -3.31274 ---> -3.31274
Training on data at index 4...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.65475 ---> 4.65475
Weight[2]: -3.31274 ---> -3.31274
Training on data at index 5...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.65475 ---> 4.65475
Weight[2]: -3.31274 ---> -3.31274
Training on data at index 6...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.65475 ---> 4.65475
Weight[2]: -3.31274 ---> -3.31274
Training on data at index 7...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.65475 ---> 4.65475
Weight[2]: -3.31274 ---> -3.31274
Training on data at index 8...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.65475 ---> 4.65475
Weight[2]: -3.31274 ---> -3.31274
Training on data at index 9...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.65475 ---> 4.65475
Weight[2]: -3.31274 ---> -3.31274

```

```
Training on data at index 10...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 4.65475 ---> 4.65475
  Weight[2]: -3.31274 ---> -3.31274
Training on data at index 11...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 4.65475 ---> 4.65475
  Weight[2]: -3.31274 ---> -3.31274
Training on data at index 12...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 4.65475 ---> 4.65475
  Weight[2]: -3.31274 ---> -3.31274
Training on data at index 13...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 4.65475 ---> 4.65475
  Weight[2]: -3.31274 ---> -3.31274
Training on data at index 14...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 4.65475 ---> 4.65475
  Weight[2]: -3.31274 ---> -3.31274
Training on data at index 15...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 4.65475 ---> 4.65475
  Weight[2]: -3.31274 ---> -3.31274
Training on data at index 16...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 4.65475 ---> 4.65475
  Weight[2]: -3.31274 ---> -3.31274
Training on data at index 17...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 4.65475 ---> 4.65475
  Weight[2]: -3.31274 ---> -3.31274
Training on data at index 18...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 4.65475 ---> 4.65475
  Weight[2]: -3.31274 ---> -3.31274
Training on data at index 19...
  Weight[0]: -0.80000 ---> 0.20000
  Weight[1]: 4.65475 ---> 4.05120
  Weight[2]: -3.31274 ---> -4.12517
Training on data at index 20...
  Weight[0]: 0.20000 ---> 0.20000
  Weight[1]: 4.05120 ---> 4.05120
  Weight[2]: -4.12517 ---> -4.12517
Training on data at index 21...
  Weight[0]: 0.20000 ---> -0.80000
  Weight[1]: 4.05120 ---> 5.00492
  Weight[2]: -4.12517 ---> -3.10197
Training on data at index 22...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 5.00492 ---> 5.00492
  Weight[2]: -3.10197 ---> -3.10197
Training on data at index 23...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 5.00492 ---> 5.00492
  Weight[2]: -3.10197 ---> -3.10197
Training on data at index 24...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 5.00492 ---> 5.00492
  Weight[2]: -3.10197 ---> -3.10197
Training on data at index 25...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 5.00492 ---> 5.00492
  Weight[2]: -3.10197 ---> -3.10197
Training on data at index 26...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 5.00492 ---> 5.00492
  Weight[2]: -3.10197 ---> -3.10197
```

```
Training on data at index 27...
  Weight[0]: -0.80000 ---> 0.20000
  Weight[1]: 5.00492 ---> 4.15621
  Weight[2]: -3.10197 ---> -4.60615
Training on data at index 28...
  Weight[0]: 0.20000 ---> 0.20000
  Weight[1]: 4.15621 ---> 4.15621
  Weight[2]: -4.60615 ---> -4.60615
Training on data at index 29...
  Weight[0]: 0.20000 ---> 0.20000
  Weight[1]: 4.15621 ---> 4.15621
  Weight[2]: -4.60615 ---> -4.60615
Training on data at index 30...
  Weight[0]: 0.20000 ---> 0.20000
  Weight[1]: 4.15621 ---> 4.15621
  Weight[2]: -4.60615 ---> -4.60615
Training on data at index 31...
  Weight[0]: 0.20000 ---> 0.20000
  Weight[1]: 4.15621 ---> 4.15621
  Weight[2]: -4.60615 ---> -4.60615
Training on data at index 32...
  Weight[0]: 0.20000 ---> 0.20000
  Weight[1]: 4.15621 ---> 4.15621
  Weight[2]: -4.60615 ---> -4.60615
Training on data at index 33...
  Weight[0]: 0.20000 ---> 0.20000
  Weight[1]: 4.15621 ---> 4.15621
  Weight[2]: -4.60615 ---> -4.60615
Training on data at index 34...
  Weight[0]: 0.20000 ---> 0.20000
  Weight[1]: 4.15621 ---> 4.15621
  Weight[2]: -4.60615 ---> -4.60615
Training on data at index 35...
  Weight[0]: 0.20000 ---> 0.20000
  Weight[1]: 4.15621 ---> 4.15621
  Weight[2]: -4.60615 ---> -4.60615
Training on data at index 36...
  Weight[0]: 0.20000 ---> 0.20000
  Weight[1]: 4.15621 ---> 4.15621
  Weight[2]: -4.60615 ---> -4.60615
Training on data at index 37...
  Weight[0]: 0.20000 ---> 0.20000
  Weight[1]: 4.15621 ---> 4.15621
  Weight[2]: -4.60615 ---> -4.60615
Training on data at index 38...
  Weight[0]: 0.20000 ---> 0.20000
  Weight[1]: 4.15621 ---> 4.15621
  Weight[2]: -4.60615 ---> -4.60615
Training on data at index 39...
  Weight[0]: 0.20000 ---> 0.20000
  Weight[1]: 4.15621 ---> 4.15621
  Weight[2]: -4.60615 ---> -4.60615
Training on data at index 40...
  Weight[0]: 0.20000 ---> 0.20000
  Weight[1]: 4.15621 ---> 4.15621
  Weight[2]: -4.60615 ---> -4.60615
Training on data at index 41...
  Weight[0]: 0.20000 ---> 0.20000
  Weight[1]: 4.15621 ---> 4.15621
  Weight[2]: -4.60615 ---> -4.60615
Training on data at index 42...
  Weight[0]: 0.20000 ---> 0.20000
  Weight[1]: 4.15621 ---> 4.15621
  Weight[2]: -4.60615 ---> -4.60615
Training on data at index 43...
  Weight[0]: 0.20000 ---> 0.20000
  Weight[1]: 4.15621 ---> 4.15621
  Weight[2]: -4.60615 ---> -4.60615
```

```
Training on data at index 44...
  Weight[0]: 0.20000 ---> 0.20000
  Weight[1]: 4.15621 ---> 4.15621
  Weight[2]: -4.60615 ---> -4.60615
Training on data at index 45...
  Weight[0]: 0.20000 ---> 0.20000
  Weight[1]: 4.15621 ---> 4.15621
  Weight[2]: -4.60615 ---> -4.60615
Training on data at index 46...
  Weight[0]: 0.20000 ---> 0.20000
  Weight[1]: 4.15621 ---> 4.15621
  Weight[2]: -4.60615 ---> -4.60615
Training on data at index 47...
  Weight[0]: 0.20000 ---> 0.20000
  Weight[1]: 4.15621 ---> 4.15621
  Weight[2]: -4.60615 ---> -4.60615
Training on data at index 48...
  Weight[0]: 0.20000 ---> 0.20000
  Weight[1]: 4.15621 ---> 4.15621
  Weight[2]: -4.60615 ---> -4.60615
Training on data at index 49...
  Weight[0]: 0.20000 ---> 0.20000
  Weight[1]: 4.15621 ---> 4.15621
  Weight[2]: -4.60615 ---> -4.60615
Predictions: [1, 1, 1, 0.0, 1, 0.0, 1, 1, 0.0, 0.0, 0.0, 0.0, 1, 1, 1, 1, 1,
0.0, 0.0, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 0.0, 0.0, 1, 0.0, 0.0, 0.0, 0.0, 1,
0.0, 1, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 1, 1, 1]

Iteration 8
Weights: [0.19999999999999996, 4.156206319183081, -4.6061466531268955]
Accuracy: 0.96
Training on data at index 0...
  Weight[0]: 0.20000 ---> -0.80000
  Weight[1]: 4.15621 ---> 4.35647
  Weight[2]: -4.60615 ---> -4.41204
Training on data at index 1...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 4.35647 ---> 4.35647
  Weight[2]: -4.41204 ---> -4.41204
Training on data at index 2...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 4.35647 ---> 4.35647
  Weight[2]: -4.41204 ---> -4.41204
Training on data at index 3...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 4.35647 ---> 4.35647
  Weight[2]: -4.41204 ---> -4.41204
Training on data at index 4...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 4.35647 ---> 4.35647
  Weight[2]: -4.41204 ---> -4.41204
Training on data at index 5...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 4.35647 ---> 4.35647
  Weight[2]: -4.41204 ---> -4.41204
Training on data at index 6...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 4.35647 ---> 4.35647
  Weight[2]: -4.41204 ---> -4.41204
Training on data at index 7...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 4.35647 ---> 4.35647
  Weight[2]: -4.41204 ---> -4.41204
Training on data at index 8...
  Weight[0]: -0.80000 ---> -0.80000
  Weight[1]: 4.35647 ---> 4.35647
  Weight[2]: -4.41204 ---> -4.41204
Training on data at index 9...
```



```
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.35647 ---> 4.35647
Weight[2]: -4.41204 ---> -4.41204
Training on data at index 10...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.35647 ---> 4.35647
Weight[2]: -4.41204 ---> -4.41204
Training on data at index 11...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.35647 ---> 4.35647
Weight[2]: -4.41204 ---> -4.41204
Training on data at index 12...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.35647 ---> 4.35647
Weight[2]: -4.41204 ---> -4.41204
Training on data at index 13...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.35647 ---> 4.35647
Weight[2]: -4.41204 ---> -4.41204
Training on data at index 14...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.35647 ---> 4.35647
Weight[2]: -4.41204 ---> -4.41204
Training on data at index 15...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.35647 ---> 4.35647
Weight[2]: -4.41204 ---> -4.41204
Training on data at index 16...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.35647 ---> 4.35647
Weight[2]: -4.41204 ---> -4.41204
Training on data at index 17...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.35647 ---> 4.35647
Weight[2]: -4.41204 ---> -4.41204
Training on data at index 18...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.35647 ---> 4.35647
Weight[2]: -4.41204 ---> -4.41204
Training on data at index 19...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.35647 ---> 4.35647
Weight[2]: -4.41204 ---> -4.41204
Training on data at index 20...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.35647 ---> 4.35647
Weight[2]: -4.41204 ---> -4.41204
Training on data at index 21...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.35647 ---> 4.35647
Weight[2]: -4.41204 ---> -4.41204
Training on data at index 22...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.35647 ---> 4.35647
Weight[2]: -4.41204 ---> -4.41204
Training on data at index 23...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.35647 ---> 4.35647
Weight[2]: -4.41204 ---> -4.41204
Training on data at index 24...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.35647 ---> 4.35647
Weight[2]: -4.41204 ---> -4.41204
Training on data at index 25...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.35647 ---> 4.35647
Weight[2]: -4.41204 ---> -4.41204
Training on data at index 26...
```

```
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.35647 ---> 4.35647
Weight[2]: -4.41204 ---> -4.41204
Training on data at index 27...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.35647 ---> 4.35647
Weight[2]: -4.41204 ---> -4.41204
Training on data at index 28...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.35647 ---> 4.35647
Weight[2]: -4.41204 ---> -4.41204
Training on data at index 29...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.35647 ---> 4.35647
Weight[2]: -4.41204 ---> -4.41204
Training on data at index 30...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.35647 ---> 4.35647
Weight[2]: -4.41204 ---> -4.41204
Training on data at index 31...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.35647 ---> 4.35647
Weight[2]: -4.41204 ---> -4.41204
Training on data at index 32...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.35647 ---> 4.35647
Weight[2]: -4.41204 ---> -4.41204
Training on data at index 33...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.35647 ---> 4.35647
Weight[2]: -4.41204 ---> -4.41204
Training on data at index 34...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.35647 ---> 4.35647
Weight[2]: -4.41204 ---> -4.41204
Training on data at index 35...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.35647 ---> 4.35647
Weight[2]: -4.41204 ---> -4.41204
Training on data at index 36...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.35647 ---> 4.35647
Weight[2]: -4.41204 ---> -4.41204
Training on data at index 37...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.35647 ---> 4.35647
Weight[2]: -4.41204 ---> -4.41204
Training on data at index 38...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.35647 ---> 4.35647
Weight[2]: -4.41204 ---> -4.41204
Training on data at index 39...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.35647 ---> 4.35647
Weight[2]: -4.41204 ---> -4.41204
Training on data at index 40...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.35647 ---> 4.35647
Weight[2]: -4.41204 ---> -4.41204
Training on data at index 41...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.35647 ---> 4.35647
Weight[2]: -4.41204 ---> -4.41204
Training on data at index 42...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.35647 ---> 4.35647
Weight[2]: -4.41204 ---> -4.41204
Training on data at index 43...
```

```
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.35647 ---> 4.35647
Weight[2]: -4.41204 ---> -4.41204
Training on data at index 44...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.35647 ---> 4.35647
Weight[2]: -4.41204 ---> -4.41204
Training on data at index 45...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.35647 ---> 4.35647
Weight[2]: -4.41204 ---> -4.41204
Training on data at index 46...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.35647 ---> 4.35647
Weight[2]: -4.41204 ---> -4.41204
Training on data at index 47...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.35647 ---> 4.35647
Weight[2]: -4.41204 ---> -4.41204
Training on data at index 48...
Weight[0]: -0.80000 ---> -0.80000
Weight[1]: 4.35647 ---> 4.35647
Weight[2]: -4.41204 ---> -4.41204
Out[5]: [-0.8, 4.356466814167831, -4.412039132895621]
```