import numpy as np

import random

def fitness(choromosome, run):

   run\_sum = 0

   for i in range(len(choromosome)):

      if choromosome[i] == 1:

         run\_sum += run[i]

   return run\_sum

print(fitness([0, 0, 0, 0, 1, 1, 1, 1], [68, 25, 70, 53, 71, 55, 66, 29]))

def select(population, fit):

    new\_fit = []

    for i in range(len(fit)):

        new\_fit.append(( fit[i], i))

    new\_fit = sorted(new\_fit, reverse=True)

    new\_fit= new\_fit[:len(population)//2]

    new\_population = []

    for j in new\_fit:

        value, idx = j

        new\_population.append(population[idx])

    return new\_population

def crossover(x, y):

    point = random.randint(1, len(x)-1)

    x\_part = x[:point]

    y\_part = y[point:]

    return x\_part + y\_part

print(crossover([0, 0, 0, 1, 0, 0, 0, 1], [1, 1, 0, 0, 0, 0, 0, 1]))

def mutate(child, rate):

   for i in range(len(child)):

      num = random.random()

      if num < rate:

         if child[i] == 1:

            child[i] = 0

         else:

            child[i] = 1

   return child

print(mutate([0, 0, 0, 1, 0, 0, 0, 1], 0.5))

def GA(population\_ , run, target, mutation\_threshold = 0.3, itr\_num = 1000):

    population = population\_

    for x in range(itr\_num):

        score = []

        for j in range(len(population)):

            score.append(fitness(population[j], run))

        for k in range(len(score)):

            if score[k] == target:

                return population[k]

        new\_selection = select(population, score)

        new\_population = []

        for i in range(len(population) - len(new\_selection)):

            x1, x2 = random.choices(new\_selection, k=2)

            x3 = crossover(x1, x2)

            x4 = mutate(x3, mutation\_threshold)

            new\_population.append(x4)

        population = new\_selection + new\_population

    return None

input\_file = open("D:\CSE BRACU\CSE422\Lab\Lab2\Input file.txt",'r')

total = input\_file.readline().split()

bat\_num, total\_run = int(total[0]), int(total[1])

run = []

batsman = []

for i in input\_file.readlines():

    i = i.split()

    batsman.append(i[0])

    run.append(int(i[1]))

print(batsman)

print(run)

start\_population = 100

population = []

for x in range(start\_population):

    rand = []

    for x in range(bat\_num):

        rand.append(random.choice([0, 1]))

    population.append(rand)

print(population)

mutation\_threshold = 0.3

itr\_num = 1000

result= GA(population, run, total\_run, mutation\_threshold, itr\_num)

if result == None:

    print(-1)

else:

    print(batsman)

    last\_str = ''

    for i in result:

        last\_str += str(i)

    print(last\_str)