import random as r

never\_found = False

def fitness(amount, population, n):

fits = []

for each\_char in population:

fit = 0

for i in range(n):

fit += amount[i]\*int(each\_char[i])

fits.append(fit)

return fits

def crossover(population, n):

#print(population)

idx = r.randrange(0, n)

l = len(population)-1

for i in range(0, int(len(population)/2)):

if len(population) > 1:

p1 = population[i]

p2 = population[i+1]

temp = p1

p1 = temp[:idx] + p2[idx:]

p2 = p2[:idx] + temp[idx:]

population.pop(0)

population.pop(0)

population.append(p1)

population.append(p2)

remove\_all\_zero = "0" \* n

if remove\_all\_zero in population:

population.remove(remove\_all\_zero)

else:

break

#print("Cross")

#print(population)

return population

def mutate(population, n):

mutated\_pop = population

for p in mutated\_pop:

idx = r.randrange(0, n)

if p[idx] == '0':

str1 = p

list1 = list(str1)

list1[idx]='1'

str1 = ''.join(list1)

mutated\_pop.pop(0)

mutated\_pop.append(str1)

else:

str1 = p

list1 = list(str1)

list1[idx] = '0'

str1 = ''.join(list1)

mutated\_pop.pop(0)

mutated\_pop.append(str1)

remove\_all\_zero = "0" \* n

if remove\_all\_zero in mutated\_pop:

mutated\_pop.remove(remove\_all\_zero)

#print("Mutated")

#print(mutated\_pop)

return mutated\_pop

cnt = 0

cnt1 = 0

def GA(amount, population, n):

global never\_found

global cnt

fits = fitness(amount, population, n)

if 0 not in fits:

if cnt < 995 and len(population) > 0:

cnt += 1

GA(amount, mutate(population, n), n)

else:

return

#print(population[fits.index(0)])

if 0 in fits:

print(population[fits.index(0)])

exit()

else:

never\_found = True

return None

#print(fits)

def GA\_cross(amount, population, n):

global never\_found

global cnt1

fits = fitness(amount, population, n)

if 0 not in fits:

if cnt1 < 995 and len(population) > 0:

cnt1 += 1

GA\_cross(amount, crossover(population, n), n)

else:

return

if 0 in fits:

print(population[fits.index(0)])

exit()

else:

never\_found = True

return None

#################################################################

input = open('C:/Users/sazza/Desktop/422lab/input.txt', 'r')

lines = input.readlines()

bank = []

n = int(lines[0])

for i in range(1, n + 1):

strg = lines[i].strip()

bank.append(strg.split(' '))

#print(bank)

amount = []

for i in range(0, n):

if bank[i][0] == 'd':

amount.append(int(bank[i][1]))

else:

amount.append(int(bank[i][1]) \* (-1))

pop\_size = 2 \*\* (n-1)

j = 1

population = []

while j <= pop\_size:

dataset = ""

for i in range(n):

data = str(r.randrange(0, 2))

dataset += data

if dataset not in population:

population.append(dataset)

j += 1

#print(population)

remove\_all\_zero = "0"\*n

if remove\_all\_zero in population:

population.remove(remove\_all\_zero)

crossover\_pop = population

GA\_cross(amount, population, n)

GA(amount, population, n)

if never\_found:

print("-1")

#print(amount)

#print(population)

#print(len(population))