B. Flip Bits

Flippy the Bird is interested in generating random strings. In particular, he likes binary strings, strings that consist of 1s and 0s. He always starts with the binary string that consists of all 0s. He has two algorithms that can generate a binary string :

Algorithm 1 :

This algorithm consists of n steps. On step i, Flippy the Bird flips bit i with ½ probability. (When a bit is flipped, 1 becomes 0 and 0 becomes 1)

Algorithm 2 :

This algorithm consists of n steps. On step i, Flippy the Bird chooses a positive integer x <= i. Then, Flippy the Bird flips the bit in position x.

Flippy the Bird generated a binary string using one of the algorithms above. Your task is to guess which algorithm was used to generate the binary string.

Task

You are given a binary string of length N. Your task is to calculate the maximum number Flippy the Bird has recorded. You need to implement the function *initialize* and *guess*:

void initialize()

- We will call this function **only once, that is in the beginning**. Do whatever initialization that is needed here.

int guess(char S[])

- S - binary string of length N, where S[i] is either ‘1’ or ‘0’, denoting the i-th bit. S[0] denotes the 1st bit and S[N - 1] denotes the last bit.
- Returns 1 if Algorithm 1 is used and 2 otherwise.

Scoring

Your program will be tested against 10 test files where each file contains T = 100000 binary strings of length N = 200. Your score for each file will depend on the number of correct guesses you made. Your final score for this task will be the minimum score among all the files. Let C be the number of correct guesses.

C	Score
<= 50000	0
50001 - 74000	15*(C - 50000)/24000
74001 - 99000	20 + 15*(C - 74000)/25000
99001 - 99900	40 + 30*(C - 99000)/900
99901 - 99990	80 + 20*(C - 99900)/90
> 99990	100

Implementation details

You have to submit exactly one file, called flipbits.cpp. This file implements the subprogram described above using the following signatures. You also need to include a header file flipbits.h.

void initialize()
int guess(char S[])

Sample Grader

The sample grader will run your guess function on T = 100000 binary strings of length N = 200 and tell you the number of correct guesses you make. It does not take input.