GPC-UPC Sick Day Contest

A. Remainder

1 second, 256 megabytes

You are given a huge decimal number consisting of n digits. It is guaranteed that this number has no leading zeros. Each digit of this number is either `0` or `1`.

You may perform several (possibly zero) operations with this number. During each operation you are allowed to change any digit of your number; you may change `0` to `1` or `1` to `0`. It is possible that after some operation you can obtain a number with leading zeroes, but it does not matter for this problem.

You are also given two integers $0 \le y < x < n$. Your task is to calculate the minimum number of operations you should perform to obtain the number that has remainder 10^y modulo 10^x. In other words, the obtained number should have remainder 10^y when divided by 10^x.

Input

The first line of the input contains three integers n, x, y ($0 \le y < x < n \le 2 \cdot 10^5$) — the length of the number and the integers x and y, respectively.

The second line of the input contains one decimal number consisting of n digits, each digit of this number is either `0` or `1`. It is guaranteed that the first digit of the number is `1`.

Output

Print one integer — the minimum number of operations you should perform to obtain the number having remainder 10^y modulo 10^x. In other words, the obtained number should have remainder 10^y when divided by 10^x.

input
11 5 2 11010100101
output
1

input
11 5 1 11010100101
output
3

In the first example the number will be 11010100100 after performing one operation. It has remainder 100 modulo 100000.

In the second example the number will be 11010100010 after performing three operations. It has remainder 10 modulo 100000.

B. Rectangle Cutting II

1 second, 256 megabytes

There is a rectangle in a coordinate plane. The coordinates of the four vertices are $(0, 0)$, $(W, 0)$, (W, H) and $(0, H)$. You are given a point (x, y) to cut the rectangle into two parts.

Find the maximum possible area of the part whose area is not larger than that of the other. Additionally, determine if there are multiple ways to cut the rectangle and achieve that maximum.

Input

The first line of input contains two integers H and W $(1 \le W, H \le 10^9)$ — The coordinates for the rectangle.

The second line of input contains two integers x and y $(0 \le x \le W, 0 \le y \le H)$ — The coordinates of the point.

Output

Print a single line — First, print the value of the maximum possible area and then print 1 if there are multiple ways to cut the rectangle and 0 otherwise.

The answer will be considered correct if absolute error doesn't exceed 10^{-7}.

input
2 3 1 2
output
3.0000000 0

For the sample case, the line $x = 1$ gives the optimal cut, and no other line does.

C. Add Points

1 second, 256 megabytes

There are n points on a straight line, and the i-th point among them is located at x_i. All these coordinates are distinct.

Determine the number m — the smallest number of points you should add on the line to make the distances between all neighboring points equal.

Input

The first line contains a single integer n ($3 \le n \le 100\,000$) — the number of points.

The second line contains a sequence of integers $x_1, x_2, \ldots, x_n$ ($-10^9 \le x_i \le 10^9$) — the coordinates of the points. All these coordinates are distinct. The points can be given in an arbitrary order.

Output

Print a single integer m — the smallest number of points you should add on the line to make the distances between all neighboring points equal.

input
3 -5 10 5
output
1

input
6 100 200 400 300 600 500
output
0

input
4 10 9 0 -1
output
8

In the first example you can add one point with coordinate 0.

In the second example the distances between all neighboring points are already equal, so you shouldn't add anything.

D. Palindrome Third

1 second, 256 megabytes

Lord El-Melloi II is a magician detective. He was trying to solve a mistery about an encrypted message in the house of his pupil Gray. They found a string that only consisted of lowercase english letters.

They had to make a ritual such that the original string would be transformed in another one that only had letters a, b and c. In addition, any two consecutive letters were different.

For the final step it was required that they determined a palindrome subsequence from the former string, but with the following condition:

- Let's denote the string as s and the palindrome subsequence taken as t, then:

$$|t| \geq \left\lceil \frac{|s|}{3} \right\rceil$$

Help Lord El-Melloi II and Gray to find any valid subsequence to solve the mistery.

Definition: A subsequence t of a string s is a string that can be obtained by eliminating some positions of s and concatenating the remaining characters from left to right. abc is a subsequence of $adbca$, but $abcd$ is not.

Input
The first line of input contains a string s $(3 \leq |s| \leq 10^5)$ — The final step string that consists only of letters a, b and c.

Output
Print a single line — A valid palindrome subsequence. It is guaranteed that there exists an answer.

Scoring
The scoring will be divided in the following subtasks:

Subtask 1 (15 points):

- $1 \leq |s| \leq 100$

Subtask 2 (35 points):

- $1 \leq |s| \leq 10^4$

Subtask 3 (50 points):

- $1 \leq |s| \leq 10^5$

input
abc
output
c

For the sample case, we need a palindrome subsequence of length at least 1, so the possible answers are:

- a
- b
- c

E. Prime Graph II

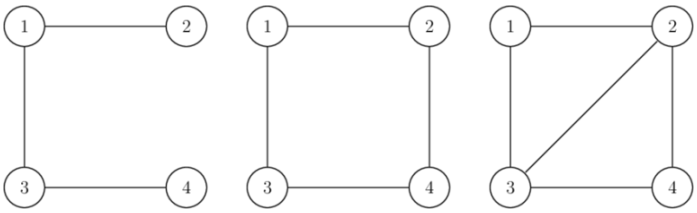
2 seconds, 256 megabytes

Every person likes prime numbers. Alice is a person, thus she also shares the love for them. Bob wanted to give her an affectionate gift but couldn't think of anything inventive. Hence, he will be giving her a graph. How original, Bob! Alice will surely be *thrilled*!

When building the graph, he needs four conditions to be satisfied:

- It must be a simple undirected graph, i.e. without multiple (parallel) edges and self-loops.
- The number of vertices must be exactly n — a number he selected. This number is not necessarily prime.
- The total number of edges must be prime.
- The degree (i.e. the number of edges connected to the vertex) of each vertex must be prime.

Below is an example for $n = 4$. The first graph (left one) is invalid as the degree of vertex 2 (and 4) equals to 1, which is not prime. The second graph (middle one) is invalid as the total number of edges is 4, which is not a prime number. The third graph (right one) is a valid answer for $n = 4$.



Note that the graph can be disconnected.

Please help Bob to find any such graph!

Input
The input consists of a single integer n $(3 \leq n \leq 10^5)$ — the number of vertices.

Output
If there is no graph satisfying the conditions, print a single line containing the integer -1.

Otherwise, first print a line containing a prime number m $(2 \leq m \leq min(10^6, \frac{n(n-1)}{2}))$ — the number of edges in the graph. Then, print m lines, the i-th of which containing two integers u_i, v_i $(1 \leq u_i, v_i \leq n)$ — meaning that there is an edge between vertices u_i and v_i. The degree of each vertex must be prime. There must be no multiple (parallel) edges or self-loops.

If there are multiple solutions, you may print any of them.

Note that the graph can be disconnected.

input
4
output
5 1 2 1 3 2 3 2 4 3 4

input
8
output
13 1 2 1 3 2 3 1 4 2 4 1 5 2 5 1 6 2 6 1 7 1 8 5 8 7 8

The first example was described in the statement.

In the second example, the degrees of vertices are $[7, 5, 2, 2, 3, 2, 2, 3]$. Each of these numbers is prime. Additionally, the number of edges, 13, is also a prime number, hence both conditions are satisfied.