Problem I. DNA

Input file:	stdin
Output file:	stdout
Time limit:	2 seconds
Memory limit:	256 megabytes

Biologists have discovered a strange DNA molecule, best described as a sequence of N characters from the set $\{A, B\}$.

An unlikely sequence of mutations has resulted in a DNA strand consisting only of A's. Biologists found that very odd, so they began studying the mutations in greater detail.

They discovered two types of mutations. One type results in changing a single character of the sequence ($A \to B$ or $B \to A$). The second type changes a whole prefix of the sequence, specifically replacing all characters in positions from 1 to K (for some K between 1 and N, inclusive) with the other character (A with B, B with A).

Compute the least possible number of mutations that could convert the starting molecule to its end state (containing only A characters). Mutations can occur in any order.

Input

The first line of input contains the positive integer N ($1 \leq N \leq 1\,000\,000$), the length of the molecule.

The second line of input contains a string with N characters, with each character being either A or B. This string represents the starting state of the molecule.

Output

The first and only line of output must contain the required minimum number of mutations.

Example

stdin	stdout
4 ABBA	2
5 BBABB	2
12 AAABBBAAABBB	4

Problem J. Quaternary Balance

Input file:	stdin
Output file:	stdout
Time limit:	2 seconds
Memory limit:	256 megabytes

Byteasar the dragon intends to throw a party, to which he would like to invite many guests. Byteasar would also like to present each guest with an amount of gold to honour the party. Each should receive the same amount, so that no one's pride is hurt. The dragon is going to weigh out gold for subsequent guests with a beam balance. He has different types of standard masses at his disposal, each type weighing a certain power of four. Conveniently, Byteasar has lots of the standard masses, hence he may use any number of masses of any type (power of four) he finds appropriate. Byteasar will always lay the gold on the left weighing basin and the masses on the right or both weighing basins. The dragon wishes to use the least number of masses possible for each weighing. Furthermore, to entertain his guests, Byteasar would like to measure out the gold in unique manner for each person (ie. using different masses or distributing them among the weighing basins in a different way).

Since dragons' lack of arithmetic skills is legendary, Byteasar has aksed you to write a programme that will determine how many guests he may invite, that is, finds the maximum number of ways in which n grammes of gold can be weighed out using the minimum number of masses possible. Should you fare well, you will also get your share!

Write a programme that:

- reads from the standard input the amount of gold (in grammes) which Byteasar intends to present each guest with,
- calculates the number of ways in which this amount of gold can be weighed out using the minimum number of masses possible,
- writes out the remainder of dividing the result by 10^9 to the standard output.

Input

In the first and only line of the standard input there is one positive integer n ($1 \leq n < 10^{1000}$). It is the amount of gold (in grammes) which Byteasar intends to present each guest with.

Output

One integer should be written out to the standard output — the remainder of dividing by 10^9 the maximum number of guests Byteasar can invite (that is, the maximum number of ways in which n grammes of gold can be weighed out using the minimum number of masses possible).

Example

stdin	stdout
166	3

Замечание

7 masses are necessary to weigh out 166 grammes. Weighing out can be carried out in the following ways:

1. gold on the left weighing basin; the masses 64, 64, 16, 16, 4, 1, 1 on the right one,
2. gold and the masses 64, 16, 16 on the left weighing basin; the masses 256, 4, 1, 1 on the right one,
3. gold and the masses 64, 16, 4, 4, 1, 1 on the left weighing basin; the mass 256 on the right one.

Problem K. Rock Garden

Input file:	`stdin`
Output file:	`stdout`
Time limit:	2 seconds
Memory limit:	256 megabytes

Vicomte de Bajteaux is the owner of a renowned collection of boulders. Up to now, he has kept it in the cellars of his palace, but recently, he has decided to display the collection in his vast gardens.

The gardens have a shape of rectangle, whose sides are 10^9 units long and are parallel to east-west and north-south geographical directions. For each boulder, vicomte has determined coordinates of the point, which he would like it to be placed in (the coordinates are simply distances to the southern and western side of the garden), and gave them to his servants. Unfortunately he has forgot to tell them the order of the coordinates (i.e. for some of the boulders the first coordinate of a point is the so called "y coordinate", i.e. the ordinate, while for others the so called "x coordinate", i.e. the abscissa). The servants, unaware of this fact, have placed the boulders assuming customary coordinate ordering (as in standard Cartesian coordinates: the abscissa, commonly known as "x coordinate", first).

To protect his collection, vicomte has decided to surround it with a fence. For aesthetic reasons the fence has to be a rectangle, with sides parallel to the sides of the garden. The garden layout has been planned, so that the total length of the fence be minimal (i.e. in the space of all coordinate orderings, the original ordering of vicomte requires the minimal length of the fence — we assume that the rectangle may have sides of zero length).

The servants have to move the boulders so that the length of the fence required is minimal lest their mistake become obvious. Each boulder may only be moved in a way that preserves the coordinate set: by interchanging its coordinates. As the boulders are heavy, the servants would like to minimize their effort, by minimizing the weight of the boulders to be moved.

Write a programme which:

- reads the present positions of the boulders in the gardens and their respective weights,
- determines a sequence of moves, which minimizes the length of the fence required to protect the boulders and also minimizes the weight of the boulders to be moved,
- writes the outcome to the standard output.

Input

The first line of the standard input contains a single integer n ($2 \leq n \leq 10^6$), denoting the number of boulders in the collection. The following n lines contain three integers x_i, y_i and m_i each ($0 \leq x_i, y_i \leq 10^9$, $1 \leq m_i \leq 2000$), separated by single spaces, denoting the present coordinates and the weight of i'th boulder. No unordered pair of coordinates will appear in the input more than once.

Output

The first line of the standard output should contain two integers, separated by a single space — the minimal length of fence possible and the minimal weight of the boulders to be moved in order to obtain such a length.

The second line should contain a sequence of n zeros and/or ones — i'th element of the sequence should be a one if in the optimal solution the i'th boulder is to be moved and zero otherwise. Should more than one correct solutions exist, your programme is to write out any one of them.

Example

stdin	stdout
5 2 3 400 1 4 100 2 2 655 3 4 100 5 3 277	10 200 01010

Problem L. Trees

Input file:	stdin
Output file:	stdout
Time limit:	2 seconds
Memory limit:	256 megabytes

Byteasar has a cottage. Lately, he has bought n trees and had them planted all in one row. Byteasar does not, however, like the order which the trees have been planted in. It particularly annoys him that tall and short ones have been mixed up, and the composition does not meet his aesthetic criteria.

Byteasar has invented a disorder coefficient so as to allow the gardener to comprehend his intentions: the lower the value of the coefficient the prettier the row of trees. It is defined in the following way: $|h_1 - h_2| + |h_2 - h_3| + \cdots + |h_{n-1} - h_n|$, where $h_1, \ldots, h_n$ are the heights of consecutive trees in a row.

Replanting is a very toilsome and cumbersome task, therefore Byteasar has ordered the gardener to replant two trees at the most (i.e. interchange their positions). The task of the gardener is to choose the pair to replant in a way that makes the disorder coefficient the smallest.

The gardener is not sure if he has chosen the correct pair of trees and he fears he may lose his job if he is mistaken. Help him: for each tree calculate the minimal disorder coefficient that may be attained by switching places with any other tree.

Write a programme which:

- reads the height of the consecutive trees in a row from the standard input,
- for each tree calculates the minimal disorder coefficient that may be attained should it switch places with some other tree (or should there be no change at all), writes the outcome to the standard output.

Input

The first line of the standard input contains one integer n ($2 \leq n \leq 50\,000$). The other contains n integers h_i ($1 \leq h_i \leq 10^8$) separated by single spaces, denoting the height of the consecutive trees in the row.

Output

The output should consist of precisely n lines. The i-th line should contain a single integer — the smallest disorder coefficient attainable when considering replanting of the i-th tree.

Example

stdin	stdout
5 7 4 5 2 5	7 7 8 7 7
5 1 2 3 4 5	4 4 4 4 4

Замечание

In the first example a value 7 of the disorder coefficient may be attained by replanting trees 1 and 4, 2 and 5 or 4 and 5. So, by replanting any of the aforementioned trees (1,2,4,5) and its counterpart a disorder

coefficient of value 7 may be obtained. Only for tree 3 the best possible result is greater — it is 8. In the second example any replanting increases the value of the disorder coefficient, so no change should take place; all disorder coefficients have the initial value (4).