A. Partial Teacher

time limit per test: 1 second
memory limit per test: 256 megabytes
input: standard input
output: standard output

A teacher decides to give toffees to his students. He asks n students to stand in a queue. Since the teacher is very partial, he follows the following rule to distribute toffees.

He looks at the first two students and gives more toffees to the student having higher marks than the other one. If they have the same marks they get the same number of toffees. The same procedure is followed for each pair of adjacent students starting from the first one to the last one.

It is given that each student receives at least one toffee. You have to find the number of toffees given to each student by the teacher such that the total number of toffees is minimum.

Input

The first line of input contains the number of students n ($2 \le n \le 1000$). The second line gives ($n - 1$) characters consisting of "L", "R" and "=". For each pair of adjacent students "L" means that the left student has higher marks, "R" means that the right student has higher marks and "=" means that both have equal marks.

Output

Output consists of n integers separated by a space representing the number of toffees each student receives in the queue starting from the first one to the last one.

Examples

input

```
5
LRLR
```

output

```
2 1 2 1 2
```

input

```
5
=RRR
```

output

```
1 1 2 3 4
```

B. Restoration of the Permutation

time limit per test: 1 second
memory limit per test: 256 megabytes
input: standard input
output: standard output

Let $A = \{a_1, a_2, \ldots, a_n\}$ be any permutation of the first n natural numbers $\{1, 2, \ldots, n\}$. You are given a positive integer k and another sequence $B = \{b_1, b_2, \ldots, b_n\}$, where b_i is the number of elements a_j in A to the left of the element $a_t = i$ such that $a_j \geq (i + k)$.

For example, if $n = 5$, a possible A is $\{5, 1, 4, 2, 3\}$. For $k = 2$, B is given by $\{1, 2, 1, 0, 0\}$. But if $k = 3$, then $B = \{1, 1, 0, 0, 0\}$.

For two sequences $X = \{x_1, x_2, \ldots, x_n\}$ and $Y = \{y_1, y_2, \ldots, y_n\}$, let i-th elements be the first elements such that $x_i \neq y_i$. If $x_i < y_i$, then X is lexicographically smaller than Y, while if $x_i > y_i$, then X is lexicographically greater than Y.

Given n, k and B, you need to determine the lexicographically smallest A.

Input

The first line contains two space separated integers n and k ($1 \leq n \leq 1000$, $1 \leq k \leq n$). On the second line are n integers specifying the values of $B = \{b_1, b_2, \ldots, b_n\}$.

Output

Print on a single line n integers of $A = \{a_1, a_2, \ldots, a_n\}$ such that A is lexicographically minimal. It is guaranteed that the solution exists.

Examples

input

```
5 2
1 2 1 0 0
```

output

```
4 1 5 2 3
```

input

```
4 2
1 0 0 0
```

output

```
2 3 1 4
```

C. Sequence of Balls

time limit per test: 1 second
memory limit per test: 256 megabytes
input: standard input
output: standard output

You are given a sequence of balls A by your teacher, each labeled with a lowercase Latin letter 'a'-'z'. You don't like the given sequence. You want to change it into a new sequence, B that suits you better. So, you allow yourself four operations:

- You can insert any ball with any label into the sequence at any position.
- You can delete (remove) any ball from any position.
- You can replace any ball with any other ball.
- You can exchange (swap) two adjacent balls.

Your teacher now places time constraints on each operation, meaning that an operation can only be performed in certain time. So, the first operation takes time t_i, the second one takes t_d, the third one takes t_r and the fourth one takes t_e. Also, it is given that $2 \cdot t_e \geq t_i + t_d$.

Find the minimal time to convert the sequence A to the sequence B.

Input

The first line contains four space-separated integers t_i, t_d, t_r, t_e ($0 < t_i, t_d, t_r, t_e \leq 100$). The following two lines contain sequences A and B on separate lines. The length of each line is between 1 and 4000 characters inclusive.

Output

Print a single integer representing minimum time to convert A into B.

Examples

input
```
1 1 1 1
youshouldnot
thoushaltnot
```
output
```
5
```

input
```
2 4 10 3
ab
ba
```
output
```
3
```

input
```
1 10 20 30
a
za
```
output
```
1
```

Note

In the second sample, you could delete the ball labeled 'a' from the first position and then insert another 'a' at the new second position with total time 6. However exchanging the balls give total time 3.

D. Optical Experiment

time limit per test: 5 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

Professor Phunsuk Wangdu has performed some experiments on rays. The setup for n rays is as follows.

There is a rectangular box having exactly n holes on the opposite faces. All rays enter from the holes of the first side and exit from the holes of the other side of the box. Exactly one ray can enter or exit from each hole. The holes are in a straight line.

Professor Wangdu is showing his experiment to his students. He shows that there are cases, when all the rays are intersected by every other ray. A curious student asked the professor: "Sir, there are some groups of rays such that all rays in that group intersect every other ray in that group. Can we determine the number of rays in the largest of such groups?".

Professor Wangdu now is in trouble and knowing your intellect he asks you to help him.

Input

The first line contains n ($1 \le n \le 10^6$), the number of rays. The second line contains n distinct integers. The i-th integer x_i ($1 \le x_i \le n$) shows that the x_i-th ray enters from the i-th hole. Similarly, third line contains n distinct integers. The i-th integer y_i ($1 \le y_i \le n$) shows that the y_i-th ray exits from the i-th hole. All rays are numbered from 1 to n.

Output

Output contains the only integer which is the number of rays in the largest group of rays all of which intersect each other.

Examples

input

```
5
1 4 5 2 3
3 4 2 1 5
```

output

```
3
```

input

```
3
3 1 2
2 3 1
```

output

```
2
```

Note

For the first test case, the figure is shown above. The output of the first test case is 3, since the rays number 1, 4 and 3 are the ones which are intersected by each other one i.e. 1 is intersected by 4 and 3, 3 is intersected by 4 and 1, and 4 is intersected by 1 and 3. Hence every ray in this group is intersected by each other one. There does not exist any group containing more than 3 rays satisfying the above-mentioned constraint.

E. Save the City!

time limit per test: 1 second
memory limit per test: 256 megabytes
input: standard input
output: standard output

In the town of Aalam-Aara (meaning the Light of the Earth), previously there was no crime, no criminals but as the time progressed, sins started creeping into the hearts of once righteous people. Seeking solution to the problem, some of the elders found that as long as the corrupted part of population was kept away from the uncorrupted part, the crimes could be stopped. So, they are trying to set up a compound where they can keep the corrupted people. To ensure that the criminals don't escape the compound, a watchtower needs to be set up, so that they can be watched.

Since the people of Aalam-Aara aren't very rich, they met up with a merchant from some rich town who agreed to sell them a land-plot which has already a straight line fence AB along which a few points are set up where they can put up a watchtower. Your task is to help them find out the number of points on that fence where the tower can be put up, so that all the criminals can be watched from there. Only one watchtower can be set up. A criminal is watchable from the watchtower if the line of visibility from the watchtower to him doesn't cross the plot-edges at any point between him and the tower i.e. as shown in figure 1 below, points X, Y, C and A are visible from point B but the points E and D are not.

Figure 1

Figure 2

Assume that the land plot is in the shape of a polygon and coordinate axes have been setup such that the fence AB is parallel to x-axis and the points where the watchtower can be set up are the integer points on the line. For example, in given figure 2, watchtower can be setup on any of five integer points on AB i.e. $(4, 8)$, $(5, 8)$, $(6, 8)$, $(7, 8)$ or $(8, 8)$. You can assume that no three consecutive points are collinear and all the corner points other than A and B, lie towards same side of fence AB. The given polygon doesn't contain self-intersections.

Input

The first line of the test case will consist of the number of vertices n ($3 \le n \le 1000$).

Next n lines will contain the coordinates of the vertices in the clockwise order of the polygon. On the i-th line are integers x_i and y_i ($0 \le x_i, y_i \le 10^6$) separated by a space.

The endpoints of the fence AB are the first two points, (x_1, y_1) and (x_2, y_2).

Output

Output consists of a single line containing the number of points where the watchtower can be set up.

Examples

input

```
5
4 8
8 8
9 4
4 0
0 4
```

output

```
5
```

input

```
5
4 8
5 8
5 4
7 4
2 2
```

output

```
0
```

Note

Figure 2 shows the first test case. All the points in the figure are watchable from any point on fence AB. Since, AB has 5 integer coordinates, so answer is 5.

For case two, fence CD and DE are not completely visible, thus answer is 0.