2016 年
台大 World Final 隊伍選拔賽

National Taiwan University

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Language	Version	Compile Flags	Extensions
C	gcc 5.4.0	`-g -O2 -std=gnu99 -static -lm`	`.c`
C++	g++ 5.4.0	`-g -O2 -std=gnu++11 -static -lm`	`.cc, .cpp`

Problem	Problem Name	Time Limit	Memory Limit
A	Hacker Cups and Balls	5 s	1024 MB
B	Bored Dreamoon	1 s	1024 MB
C	Crazy Dreamoon	1 s	1024 MB
D	Forest Game	5 s	1024 MB
E	Lines Game	2 s	1024 MB
F	Lonely Dreamoon 2	1 s	1024 MB
G	Dreamoon and NightMarket	1 s	1024 MB
H	Split Game	1 s	1024 MB
I	Tree Game	1 s	1024 MB
J	Zero Game	1 s	1024 MB
K	Fake Problem	10 s	1024 MB


我也要
战斗下去
才行

A. Hacker Cups and Balls

Problem ID: ademnoor

The dark side of Dreamoon, Ademnoor, wants to play an interesting game with you. Did you heard the game "cups and balls"? Here is the hacker version of it!

There are n cups and n balls, both are numbered $1, 2, \ldots, n$. Initially, The a_i-th ball is placed in the i-th cup. Thus each cup will have exactly one ball inside. Admenoor will perform m magic operations on these balls and cups. The i-th operation will sort all the balls in the cups numbered between l_i and r_i, inclusively. The sorting could be performed in either ascending order or descending order. After these m operations, you need to answer which ball is placed in the center cup. We guarantee that n would be an odd integer, so the center cup means the $\frac{n+1}{2}$-th cup.

For example, if $n = 5, m = 2$ and $a = [5, 1, 4, 2, 3]$. If the first operation is sort the balls in the cups numbered between 1 and 4 in ascending order, then a would become $[1, 2, 4, 5, 3]$. If the second operation is sort the balls in the cups numbered between 2 and 5 in descending order, then a would become $[1, 5, 4, 3, 2]$. In this example, the number of final ball in the center cup is 4.

Input

The first line of input contains two integers n, m. The following line contains n integers $a_1, a_2, \ldots, a_n$. Each of the following m lines contains two integers l_i, r_i. If $l_i < r_i$, Admenoor will sort that balls in ascending order in this operation; Otherwise, the balls will be sorted in descending order in this operation.

- $1 \leq n \leq 99999$
- n is an odd integer
- $0 \leq m \leq 10^5$
- $1 \leq a_i \leq n$
- $\langle a_i \rangle$ is a permutation of $1, 2, \ldots, n$
- $1 \leq l_i, r_i \leq n$

Output

Output a single line with the number of the ball in the center cup.

Sample Input 1	Sample Output 1
3 2 1 3 2 1 3 3 1	2

Sample Input 2	Sample Output 2
5 2 5 1 4 2 3 1 4 5 2	4

B. Bored Dreamoon

Problem ID: bored

Dreamoon serves in military this year. Everything in military is boring. In order to make military life more interesting, Dreamoon determines to make something in military to programming competition problems. The leaders usually order soldiers to stand in several rows ordered by their heights. The rule of arrangement of soldiers is as following:

- if two soldiers A and B stand in different rows and A's row is in front of B's row, A is shorter than B.
- if two soldiers A and B stand in the same row and A is right of B, A is shorter than B.
- the differece between number of soldiers in any two rows is at most 1.
- For any two rows, the number of soldiers in front row is equal or larger than the back row.

Noticing these property, the following problem come into Dreamoon' mind:

For two different soldiers A and B, we say B is right front of A if A's row is NOT in front of the B's row and the number of soldiers right of B in B's row is not larger than the number of soldiers right of A in A's row. You don't know how many soldiers in total and your don't know how many rows these soldiers are arranged. But you have some information about certain N soldiers, numbered from 1 through N. You are given the height of these soldiers. And for any distinct number i and j, you know whether soldier j is right front of i. Please inspect whether there exist at least one possible configuration satisfying these information. If possible, you should calculate the minimum number of soldiers in the head row.

Input

The first line of input containing one integer N, indicating you have information of N soldiers. The second line of input consists of N integer $h_1, h_2, \ldots, h_N$. h_i indicates the height of i-th soldier. Each line of following N lines containg N characters. The j-th character in i-th line is '1' iff soldier j is right front of soldier i; Otherwise it's '0'.

- $2 \leq N \leq 10^3$
- $1 \leq h_i \leq 10^9$
- all h_i are distinct

- s_{ij} = '0' or '1'
- s_{ii} = '0' for all i in $1 \sim N$

Output

Output only one number indicating the minimum possible number of soldiers in the head row. If there's no possible configuration satisfying these information, output -1.

Sample Input 1

```
3
1 2 3
000
000
000
```

Sample Output 1

```
3
```

Sample Input 2

```
3
1 2 3
000
100
110
```

Sample Output 2

```
1
```

C. Crazy Dreamoon

Problem ID: crazy

Dreamoon like algorithm competitions very much. But when he feels crazy due to he cannot figure out any solution of any problem in a competition, he often draws many meaningless straight lines on his calculation paper. Dreamoon's calculation paper is spcial becuase there are horizontal and vertical grid lines on it. You can image the calculation paper as the plan coordinate system with range $[0, 2000] \times [0, 2000]$ and all lines with function $x = c$ or $y = c$ for any integer c between 0 and 2000 compose the grid lines. Now, Dreamoon wonders how many grids are crossed by at least one of the lines he draw. Please help Dreamoon to count the answer. Note that we don't consider touching the edge of grid as crossing.

Input

The first line of input contains an integer N, denoting the number of lines dreamoon draw. The i-th line of following N lines contain four integers $x_{i1}, y_{i1}, x_{i2}, y_{i2}$, denoting the i-th line Dreamoon draw is a straight line between Point (x_{i1}, y_{i1}) and (x_{i2}, y_{i2}).

- $1 \leq N \leq 2 \times 10^3$
- $0 \leq x_{i1}, y_{i1}, x_{i2}, y_{i2} \leq 2 \times 10^3$
- the length of all lines in input are non-zero

Output

Output one integer in single line, representing how many grids are crossed by lines which Dreamoon draw.

Sample Input 1	Sample Output 1
3 0 0 5 5 0 5 5 0 0 5 5 0	9

Sample Input 2	Sample Output 2
1 0 0 4 3	6

Sample Input 3	Sample Output 3
2 0 0 4 3 1 0 3 3	6

D. Forest Game

Problem ID: forest

There is a boring game about removing nodes from forest. Initially, there is only one tree with N nodes in the forest and your initial score is 0. The game process is following:

1. If the forest is empty, the game is finished. Otherwise, you will choose uniformly at random one node from current forest.
2. Your score will increase by the size of the tree which your chosen node belongs to.
3. Removing your chosen node and all edge connect to this node. Then go to step 1.

Please calculate the expected value of your final score multipled by $N!$, modulo $10^9 + 7$.

Input

The first line of input containing one integer N, indicating the number of node of initial tree.

Each line of following $N - 1$ lines containg two integer x, y, indicating the x-th node and y-th node is connected by an edge in given tree. Nodes are numbered from 1 through N.

- $1 \leq N \leq 10^5$
- $1 \leq x, y \leq N$
- The given graph is a tree

Output

Output only one number indicating the expected value of final score of this boring game.

Sample Input 1	Sample Output 1
2 1 2	6

Sample Input 2	Sample Output 2
3 1 2 2 3	34

E. Lines Game

Problem ID: lines

There is a game about removing N straight lines in plane. Lines are numbered from 1 through N. The i-th line connect points (0, i) and (1, p_i). Your are also given N positive integer $v_1, v_2, \ldots, v_N$. In each step, you can choose a line i which isn't removed yet and remove it and all lines intersect with it by spending cost v_i (Note that you MUST remove all lines intersect with i-th line). The purpose of this game is removing all lines with minimum cost. Please answer how many cost you need to spend when you play the game with best stratagy.

Input

The input consists of three lines. The first line contains an integer N. The second line consists of N integers $p_1, p_2, \ldots, p_N$. The Third line consists of N integer $v_1, v_2, \ldots, v_N$.

- $1 \leq N \leq 10^5$
- $\langle p_i \rangle$ is a permutation of $1, 2, \ldots, N$
- $1 \leq v_i \leq 2 \times 10^4$

Output

Output only one number indicating the minimum cost of this lines game.

Sample Input 1

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

Sample Output 1

```
4
```

Sample Input 2

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

Sample Output 2

```
10
```

Sample Input 3	Sample Output 3
4 3 1 4 2 1 9 9 1	10

F. Lonely Dreamoon 2

Problem ID: lonely2

Dreamoon, who doesn't have a girlfriend, often goes for a walk along some streets in Taipei while thinking problems from algorithm competitions. Unfortunately, there are so many couples acting lovey-dovey on the street so Dreamoon could not focus on thinking those problems.

Oneday, besides those love birds, Dreamoon discovered a problem input containing an integer sequence: $a_1, a_2, a_3, ..., a_N$!

Dreamoon thought: because I'm single, every pair of consecutive numbers should have large difference! This is, Dreamoon wants to make the value $\min_{i=2\sim N}(|a_i - a_{i-1}|)$ as large as possible.

So Dreamoon turned on Drazil, who does have a girlfriend, and forced Drazil to fulfill the above condition by reorder this integer sequence. Please help poor Drazil > _ <

Input

The input consists of two lines. The first line contains an integer N. The second line consists of N integers $a_1, a_2, \ldots, a_N$

- $2 \leq N \leq 2 \times 10^5$
- $-10^9 \leq a_i \leq 10^9$

Output

Output a single line consisting of N integers, denoting the integer sequence a after reorder. The sequence must satisfy no other order of this sequence have larger value of $\min_{i=2\sim N} |a_i - a_{i-1}|$. If there are more than one proper order, you can output any of them.

Your output format should be strict. Two consecutive numbers are separated by exactly one space. And you cannot output any additional spaces in beginning or end of line. Also, you should print newline in end of line.

Sample Input 1	Sample Output 1
3 3 1 5	1 3 5

Sample Input 2	Sample Output 2
4 -1 -1 1 1	-1 1 -1 1

G. Dreamoon and NightMarket

Problem ID: nightmarket

Dreamoon always eats dinner at Jinmei Night Market after moving to Taipei. There are N kind of food sold in the Jinmei Night Market. These foods are numbered from 1 trough N. The price of one piece of i-th food is p_i.

Every night, Dreamoon will choose a non-empty set of foods and eat one piece of each food in this set. Dreamoon likes new things. So he won't choose the same set in different night. Besides this, because Dreamoon is a poor boy, He will choose the cheapest foods set that he didn't choose before.

Now, you are given a positive integer number K. Can you help dreamoon to choose the foods set in K-th day? You only have to tell him how much he would spent in this day.

Input

The input consists of two lines. The first line contains an integer N. The second line consists of N integers $p_1, p_2, \ldots, p_N$

- $2 \leq N \leq 2 \times 10^5$
- $1 \leq K \leq \min(10^6, 2^N - 1)$
- $1 \leq p_i \leq 10^8$

Output

Output only one number indicating how much Dreamoon would spent for foods in K-th day.

Sample Input 1	Sample Output 1
5 30 4 2 1 16 8	30

Sample Input 2	Sample Output 2
4 5 1 1 2 2	2

H. Split Game

Problem ID: split

There is a game about spliting a simple polygon with N vertices in plane. The purpose of this game is using a straight line which passes origin to split the given simple polygon to as many non-zero area region as possible. Please finish the game with best result.

Input

The input consists of $N+1$ lines. The first line contains an integer N. The i-th line of following N line consists of two integers x_i, y_i, indicating the vertices of given polygon in counter-clock wise order.

- $1 \leq N \leq 10^5$
- $1 \leq x_i, y_i \leq 10^9$
- if $i \neq j$, $(x_i,y_i) \neq (x_j,y_j)$
- the given points are given in counter-clockwise order

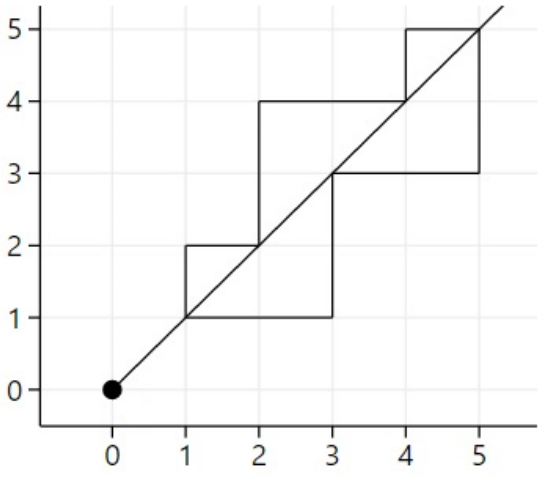
Output

Output only one number indicating the maximum non-zero area region can be splited by one line which pass through origin.

Sample Input 1	Sample Output 1
4 1 1 2 1 2 2 1 2	2

Sample Input 2	Sample Output 2
6 2 1 4 2 8 4 4 8 2 4 1 2	2

Sample Input 3	Sample Output 3
10 1 1 3 1 3 3 5 3 5 5 4 5 4 4 2 4 2 2 1 2	5



one possible answer for sample 3

I. Tree Game

Problem ID: tree

There is a game about coloring edges in tree. You are given a tree. Initially, the color of all edges is white. We define a valid path as a simple path which all edges in it are white and two endpoints are leaf. In each step of this game, you can choose a valid path and color all edges in it into black. You cannot stop your game until you cannot find any valid path. The purpose of this game is use minimum steps to complete the game. Please answer minimum number of steps for given tree.

Input

The first line of input containing one integer N, indicating the number of node of given tree.

Each line of following $N-1$ lines containg two integer x, y, indicating the x-th node and y-th node is connected by an edge in given tree. Nodes are numbered from 1 through N.

- $2 \leq N \leq 10^5$
- $1 \leq x, y \leq N$
- The given graph is a tree.

Output

Output only one number indicating the minimum step to complete this game.

Sample Input 1	Sample Output 1
7 1 2 1 3 2 4 2 5 3 6 3 7	1

Sample Input 2	Sample Output 2
9 1 2 1 3 2 4 2 5 3 6 3 7 8 2 9 3	3

J. Zero Game

Problem ID: zero

You are given one string S consisting of only '0' and '1'. You are so boring so you start to play with the string. In each operation you can move any character of this string to other position of the string. For example, suppose $S =$ '0010', then you can move the first zero to the tail and S will become '0100'. Now you has Q numbers $K_1, K_2, \ldots, K_Q$. For each i, you wonder the maximum number of consecutive zero in the string if you use at most K_i operation. In order to satisfy your curiosity, please find the answer by yourself.

Input

The first line of input contains one string S. The second line of input contains one integer Q. Each line of following Q lines contains one integer K_i, indicating the maximum number of operation of i-th query.

- $2 \leq N \leq 10^6$
- length of S is exactly N
- S consists of only '0' and '1'
- $1 \leq Q \leq 10^5$
- $N \times Q \leq 2 \times 10^7$
- $1 \leq K_i \leq 10^6$

Output

For each query, Output one number in one line, indicating the answer for this query.

Sample Input 1	Sample Output 1
0000110000111110 5 1 2 3 4 5	5 8 9 9 9

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K. Fake Problem

Problem ID: fake

This is fack problem.

Input

tmt514

Output

How Way!

Sample Input 1	Sample Output 1
tmt514	How Way!

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