A - Shuffled Equation

Time Limit: 2 sec / Memory Limit: 1024 MB

Score : 100 points

Problem Statement

You are given a sequence of integers $A = (A_1, A_2, A_3)$.
Let $B = (B_1, B_2, B_3)$ be any permutation of A.
Determine whether it is possible that $B_1 \times B_2 = B_3$.

Constraints

- All input values are integers.
- $1 \leq A_1, A_2, A_3 \leq 100$

Input

The input is given from Standard Input in the following format:

$A_1 \quad A_2 \quad A_3$

Output

If it is possible that $B_1 \times B_2 = B_3$, print `Yes`; otherwise, print `No`.

Sample Input 1

```
3 15 5
```

Sample Output 1

```
Yes
```

Here, $A = (3, 15, 5)$. By rearranging it as $B = (3, 5, 15)$, we can satisfy $B_1 \times B_2 = B_3$.

Sample Input 2

```
5 3 2
```

Sample Output 2

```
No
```

No permutation of B satisfies $B_1 \times B_2 = B_3$.

B - Who is Missing?

Time Limit: 2 sec / Memory Limit: 1024 MB

Score : 200 points

Problem Statement

You are given a sequence of M integers $A = (A_1, A_2, \dots, A_M)$.
Each element of A is an integer between 1 and N, inclusive, and all elements are distinct.

List all integers between 1 and N that do not appear in A in ascending order.

Constraints

- All input values are integers.
- $1 \leq M \leq N \leq 1000$
- $1 \leq A_i \leq N$
- The elements of A are distinct.

Input

The input is given from Standard Input in the following format:

$$
\begin{array}{l}
N \quad M \\
A_1 \quad A_2 \quad \dots \quad A_M
\end{array}
$$

Output

Let $(X_1, X_2, \dots, X_C)$ be the sequence of all integers between 1 and N, inclusive, that do not appear in A, listed in ascending order. The output should be in the following format:

$$
\begin{array}{l}
C \\
X_1 \quad X_2 \quad \dots \quad X_C
\end{array}
$$

Sample Input 1

```
10 3
3 9 2
```

Sample Output 1

```
7
1 4 5 6 7 8 10
```

Here, $A = (3, 9, 2)$.
The integers between 1 and 10 that do not appear in A, listed in ascending order, are $1, 4, 5, 6, 7, 8, 10$.

Sample Input 2

```
6 6
1 3 5 2 4 6
```

Sample Output 2

```
0
```

No integer between 1 and 6 is missing from A.

In this case, print `0` on the first line and leave the second line empty.

Sample Input 3

```
9 1
9
```

Sample Output 3

```
8
1 2 3 4 5 6 7 8
```

C - Bib

Time Limit: 2 sec / Memory Limit: 1024 MB

Score : 300 points

Problem Statement

There are N people numbered from 1 to N.

Person i is wearing a bib with the number Q_i and is staring at person P_i.

For each $i = 1, 2, \ldots, N$, find the number written on the bib of the person that the person wearing the bib with number i is staring at.

Constraints

- $2 \leq N \leq 3 \times 10^5$
- $1 \leq P_i \leq N$
- The values of P_i are distinct.
- $1 \leq Q_i \leq N$
- The values of Q_i are distinct.
- All input values are integers.

Input

The input is given from Standard Input in the following format:

N
$P_1 \ P_2 \ \ldots \ P_N$
$Q_1 \ Q_2 \ \ldots \ Q_N$

Output

Let S_i be the number written on the bib of the person that the person wearing the bib with number i is staring at.
Print $S_1, S_2, \ldots, S_N$ in this order, separated by a single space.

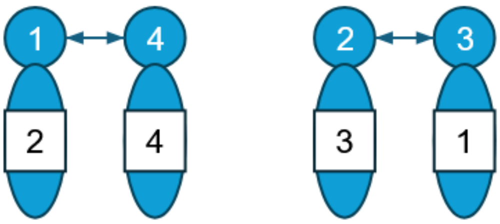
Sample Input 1

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

Sample Output 1

```
3 4 1 2
```

Person 3 is wearing the bib with the number 1, and the person that person 3 is staring at, person 2, is wearing the bib with the number 3. Thus, the answer for $i = 1$ is 3.



Sample Input 2

```
10
2 6 4 3 7 8 9 10 1 5
1 4 8 2 10 5 7 3 9 6
```

Sample Output 2

```
4 8 6 5 3 10 9 2 1 7
```

D - Doubles

Time Limit: 2 sec / Memory Limit: 1024 MB

Score : 400 points

Problem Statement

There are N dice. The i-th die has K_i faces, with the numbers $A_{i,1}, A_{i,2}, \ldots, A_{i,K_i}$ written on them. When you roll this die, each face appears with probability $\frac{1}{K_i}$.

You choose two dice from the N dice and roll them. Determine the maximum probability that the two dice show the same number, when the dice are chosen optimally.

Constraints

- $2 \leq N \leq 100$
- $1 \leq K_i$
- $K_1 + K_2 + \cdots + K_N \leq 10^5$
- $1 \leq A_{i,j} \leq 10^5$
- All input values are integers.

Input

The input is given from Standard Input in the following format:

$$
\begin{array}{l}
N \\
K_1 \quad A_{1,1} \quad A_{1,2} \quad \ldots \quad A_{1,K_1} \\
\vdots \\
K_N \quad A_{N,1} \quad A_{N,2} \quad \ldots \quad A_{N,K_N}
\end{array}
$$

Output

Print the answer. Your answer is considered correct if the absolute or relative error from the true solution does not exceed 10^{-8}.

Sample Input 1

```
3
3 1 2 3
4 1 2 2 1
6 1 2 3 4 5 6
```

Sample Output 1

```
0.333333333333333
```

- When choosing the 1st and 2nd dice, the probability that the outcomes are the same is $\frac{1}{3}$.
- When choosing the 1st and 3rd dice, the probability is $\frac{1}{6}$.
- When choosing the 2nd and 3rd dice, the probability is $\frac{1}{6}$.

Therefore, the maximum probability is $\frac{1}{3} = 0.3333333333\ldots$.

Sample Input 2

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

Sample Output 2

```
0.666666666666667
```

E - Cables and Servers

Time Limit: 2 sec / Memory Limit: 1024 MB

Score : 450 points

Problem Statement

There are N servers numbered from 1 to N and M cables numbered from 1 to M.
Cable i connects servers A_i and B_i bidirectionally.

By performing the following operation some number of times (possibly zero), make all servers connected via cables.

- Operation: Choose one cable and reconnect one of its ends to a different server.

Find the minimum number of operations required and output an operation sequence achieving this minimum.

Constraints

- $2 \leq N \leq 2 \times 10^5$
- $N - 1 \leq M \leq 2 \times 10^5$
- $1 \leq A_i, B_i \leq N$
- All input values are integers.

Input

The input is given from Standard Input in the following format:

$$
\begin{aligned}
&N \quad M \\
&A_1 \quad B_1 \\
&A_2 \quad B_2 \\
&\vdots \\
&A_M \quad B_M
\end{aligned}
$$

Output

Let the minimum number of operations be K. Print $K + 1$ lines.

- The first line should contain K.
- The $(i + 1)$-th line should contain three space-separated integers: the number of the cable chosen in the i-th operation, the server number that was originally connected at that end, and the server number to which it is connected after the operation, in this order.

If there are multiple valid solutions, any one of them will be accepted.

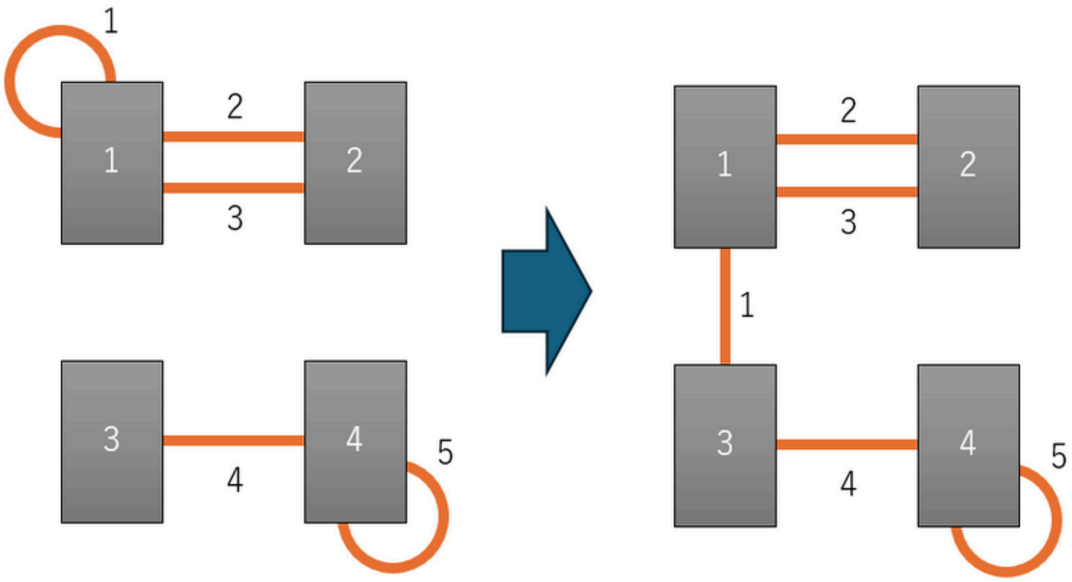
Sample Input 1

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

Sample Output 1

```
1
1 1 3
```

By reconnecting the end of cable 1 that is connected to server 1 to server 3, the servers can be connected via cables.



Operations such as reconnecting the end of cable 5 that is connected to server 4 to server 1, or reconnecting the end of cable 2 that is connected to server 2 to server 3, will also result in all servers being connected and are considered correct.

Sample Input 2

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

Sample Output 2

```
0
```

No operation may be necessary.

Sample Input 3

```
5 4
3 3
3 3
3 3
3 3
```

Sample Output 3

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

F - Insert

Time Limit: 2 sec / Memory Limit: 1024 MB

Score : 500 points

Problem Statement

There is an empty array A. For $i = 1, 2, \ldots, N$, perform the following operation in order:

- Insert the number i into A so that it becomes the P_i-th element from the beginning.
  - More precisely, replace A with the concatenation of the first $P_i - 1$ elements of A, then i, then the remaining elements of A starting from the P_i-th element, in this order.

Output the final array A after all operations have been completed.

Constraints

- $1 \leq N \leq 5 \times 10^5$
- $1 \leq P_i \leq i$
- All input values are integers.

Input

The input is given from Standard Input in the following format:

$$N$$
$$P_1 \quad P_2 \quad \ldots \quad P_N$$

Output

Let the final array be $A = (A_1, A_2, \ldots, A_N)$. Print $A_1, A_2, \ldots, A_N$ in this order, separated by spaces.

Sample Input 1

```
4
1 1 2 1
```

Sample Output 1

```
4 2 3 1
```

The operations are performed as follows:

- Insert the number 1 so that it becomes the 1st element of A. Now, $A = (1)$.
- Insert the number 2 so that it becomes the 1st element of A. Now, $A = (2, 1)$.
- Insert the number 3 so that it becomes the 2nd element of A. Now, $A = (2, 3, 1)$.
- Insert the number 4 so that it becomes the 1st element of A. Now, $A = (4, 2, 3, 1)$.

Sample Input 2

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

Sample Output 2

```
1 2 3 4 5
```

G - Fine Triplets

Time Limit: 3 sec / Memory Limit: 1024 MB

Score : 600 points

Problem Statement

For integers A, B, C ($A < B < C$), if they satisfy $B - A = C - B$, then (A, B, C) is called a **fine triplet**.
You are given a set of N distinct positive integers $S = \{S_1, S_2, \dots, S_N\}$. Find the number of fine triplets (A, B, C) with $A, B, C \in S$.

Constraints

- All input values are integers.
- $1 \leq N \leq 10^6$
- $1 \leq S_i \leq 10^6$
- The elements of S are distinct.

Input

The input is given from Standard Input in the following format:

N
$S_1 \quad S_2 \quad \dots \quad S_N$

Output

Print the number of fine triplets as an integer.

Sample Input 1

```
5
8 3 1 5 2
```

Sample Output 1

```
3
```

Here, $S = \{8, 3, 1, 5, 2\}$. The fine triplets to be counted are the following three:

- $(1, 2, 3)$
- $(1, 3, 5)$
- $(2, 5, 8)$

Sample Input 2

```
7
300000 100000 499998 499999 200000 400000 500000
```

Sample Output 2

```
5
```

Sample Input 3

```
10
13 1 16 15 12 4 7 10 2 19
```

Sample Output 3

```
10
```