Find Root

Find the root for the equation:

$$a * e^{-x} + b * \sin(x) + c * \cos(x) + d * \tan(x) + e * x^2 + f =$$

Where x is a real number in [0,1] (i.e., 0 ≤ x ≤ 1)

Input

Input consists of a single test case. The test case consists of 6 integers in a single line: a, b, c, d, e and f (where 0 ≤ a, c ≤ 20, −20 ≤ b, d, e ≤ 0, and -10^9 ≤ f ≤ 10^9).

Output

The output should be a single line containing the value x of the root for the above equation, correct up to 4 decimal places (there should be exactly 4 digits after the decimal point), or the string ‘No solution’, whichever is applicable.

You can assume that there will be only one root in [0,1] if it exists.

Example 1

```
Input:
0 0 0 0 1 -1

Output:
1.0000
```

Example 2

```
Input:
0 0 0 0 1 0

Output:
0.0000
```

Example 3

```
Input:
1 0 0 0 0 1

Output:
No solution
```

Kou Sort

Kou just finished her first algorithm class and designed a new sorting algorithm: given an array of N distinct numbers, the algorithm sorts them in ascending order by performing the minimum number of swaps required. A *swap* is an exchange of two adjacent elements in the array.

For example, if the array is [9, 1, 0, 5, 4], the smallest number of required swaps to produce the array [0, 1, 4, 5, 9] is 6.

0: [9, 1, 0, 5, 4] (original array)
1: [1, 9, 0, 5, 4] (swap 1)
2: [1, 0, 9, 5, 4]
3: [1, 0, 5, 9, 5]
4: [1, 0, 5, 4, 9]
5: [0, 1, 5, 4, 5]
6: [0, 1, 4, 5, 9] (swap 6)

(Note that there may be other sequences of swaps that lead to the minimum number of swaps.)

Now Kou wants to determine if her algorithm always performs as she claims it does. Given an array of N distinct integers, your task is to figure out the minimum number of swaps required to sort it. Kou will then make sure that her algorithm performs exactly that number of swaps.

Input

The first line of the input contains a single integer N (1 <= N <= 500,000), the size of that array. The following N lines represent the content of the input array. Each of these N lines contains a single integer between 0 and 999,999,999. It is guaranteed that the array contains no duplicates.

Output

You should print one line containing a single integer: the minimum number of swaps required to sort the given array.

Example 1

```
Input:
5
9
1
0
5
4

Output:
6
```

Example 2

```
Input:
3
1
2
3

Output:
0
```

Load Balance

You are an operator of a super computing center and in control of M nodes. One day, a research institute from Light Kingdom submitted N computational tasks. Given the computational power needed for each task, you are to distribute the tasks among the available nodes. Restriction: every node can process up to two tasks. You also want to distribute the workload as evenly as possible, i.e. minimize the following imbalance value

$$Imb = \sum_{i=0}^{M-1} |Avg - Load_i|$$

where *Avg* is average load per node and $Load_i$ is the load of the i-th node.

Input

The first line of the input contains two integers M (1 <= M <= 5) and N (1 <= N <= 2M), indicating the number of nodes you control and the number of tasks, respectively.

The second line contains N integers, each of which represents the computational power required for a task. Numbers on these line are between 1 and 1000.

Output

Print one line `IMBALANCE = I` where `I` is the minimum imbalance value rounded to 5 decimal places.

Example 1

```
Input:
2 3
6 3 8

Output:
IMBALANCE = 1.00000
```

Example 2

```
Input:
3 5
51 19 27 14 33

Output:
IMBALANCE = 6.00000
```

Example 3

```
Input:
5 9
1 2 3 5 7 11 13 17 19

Output:
IMBALANCE = 11.60000
```

Nucleic Acids

For a string S of length N, we can define inversion as follows: If for an integer pair (i,j), we have $0 \le i < j < N$, and $S[i]>S[j]$, then (i,j) is a inversion for S.

Define a function Count(S), which returns the number of distinct inversions in S.

For example, Count("ABC") = 0 since "ABC" is sorted, and Count("DAABEC") = 5, since D is greater than four letters to its right and E is greater than one letter to its right.

You are responsible for cataloging a sequence of nucleic acid strings, which are strings containing only the four letters A, C, G, and T. The Count(S) is a measure of "unsortedness" for S. You want to catalog them in order of "unsortedness", from "most sorted" to "least sorted". All the strings are of the same length.

Input

The first line contains 2 integers: a positvie n ($0 < n \le 50$) giving the length of all strings, and a positive integer m ($0 < m \le 100$) giving the number of strings, These are followed by m lines, each containing a string of length n.

Output

Output m lines, the list of input strings, arranged from "most sorted" to "least sorted". If two or more strings are equally sorted, list them in the same order they are in the input file.

Example 1

```
Input:
6 3
GATCAG
ACCCTT
AAAAAA

Output:
ACCCTT
AAAAAA
GATCAG
```

Party Fee

Saya just graduated from her high school! She and her classmates rented a ballroom and held a party to celebrate their graduation. They realized that the room fee was not split evenly since some of them did not bring enough money. After going home, they decided to re-split the fee. However, the payment app they use only allows transfers between friends. As a kind person, you want to help them out.

You will be given information about how much money each of them owes or is owed and whom the friends are. Your task is to figure out if it is possible for them to redistribute the party fee evenly.

Input

The first line of the input contains two integers N (2 <= N <= 10,000) and M (0 <= M <= 50,000), representing the number of students and the number of friendships, respectively.

Each of the following N lines contains a single integer d (-10,000 <= d <= 10,000), indicating how much that student owes (if d > 0) or is owed (if d < 0). The student had already paid the right amount of the party fee if d is 0. It is guaranteed that sum of all d's is 0.

The following M lines describe friendships. Each of these M lines contains two integers a and b (0 <= a < b < N), meaning that the a-th and the b-th student are friends. Note that a friendship may appear more than once and it is also possible that someone is friends with themselves.

Output

You should print one line containing `POSSIBLE` or `IMPOSSIBLE`, indicating if it is possible for them to redistribute the party fee only by sending money to their friends.

Example 1

```
Input:
5 3
100
-75
-25
-42
42
0 1
1 2
3 4

Output:
POSSIBLE
```

Example 2

```
Input:
4 2
15
20
-10
-25
0 2
1 3

Output:
IMPOSSIBLE
```