Codeforces Round #384 (Div. 2)

A. Vladik and flights

time limit per test: 2 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

Vladik is a competitive programmer. This year he is going to win the International Olympiad in Informatics. But it is not as easy as it sounds: the question Vladik face now is to find the cheapest way to get to the olympiad.

Vladik knows n airports. All the airports are located on a straight line. Each airport has unique id from 1 to n, Vladik's house is situated next to the airport with id a, and the place of the olympiad is situated next to the airport with id b. It is possible that Vladik's house and the place of the olympiad are located near the same airport.

To get to the olympiad, Vladik can fly between any pair of airports any number of times, but he has to start his route at the airport a and finish it at the airport b.

Each airport belongs to one of two companies. The cost of flight from the airport i to the airport j is zero if both airports belong to the same company, and $|i - j|$ if they belong to different companies.

Print the minimum cost Vladik has to pay to get to the olympiad.

Input

The first line contains three integers n, a, and b ($1 \le n \le 10^5$, $1 \le a, b \le n$) — the number of airports, the id of the airport from which Vladik starts his route and the id of the airport which he has to reach.

The second line contains a string with length n, which consists only of characters 0 and 1. If the i-th character in this string is 0, then i-th airport belongs to first company, otherwise it belongs to the second.

Output

Print single integer — the minimum cost Vladik has to pay to get to the olympiad.

Examples

input

```
4 1 4
1010
```

output

```
1
```

input

```
5 5 2
10110
```

output

```
0
```

Note

In the first example Vladik can fly to the airport 2 at first and pay $|1 - 2| = 1$ (because the airports belong to different companies), and then fly from the airport 2 to the airport 4 for free (because the airports belong to the same company). So the cost of the whole flight is equal to 1. It's impossible to get to the olympiad for free, so the answer is equal to 1.

In the second example Vladik can fly directly from the airport 5 to the airport 2, because they belong to the same company.

B. Chloe and the sequence

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

Chloe, the same as Vladik, is a competitive programmer. She didn't have any problems to get to the olympiad like Vladik, but she was confused by the task proposed on the olympiad.

Let's consider the following algorithm of generating a sequence of integers. Initially we have a sequence consisting of a single element equal to 1. Then we perform $(n - 1)$ steps. On each step we take the sequence we've got on the previous step, append it to the end of itself and insert in the middle the minimum positive integer we haven't used before. For example, we get the sequence $[1, 2, 1]$ after the first step, the sequence $[1, 2, 1, 3, 1, 2, 1]$ after the second step.

The task is to find the value of the element with index k (the elements are numbered from 1) in the obtained sequence, i. e. after $(n - 1)$ steps.

Please help Chloe to solve the problem!

Input

The only line contains two integers n and k ($1 \le n \le 50$, $1 \le k \le 2^n - 1$).

Output

Print single integer — the integer at the k-th position in the obtained sequence.

Examples

input
```
3 2
```
output
```
2
```

input
```
4 8
```
output
```
4
```

Note

In the first sample the obtained sequence is $[1, 2, 1, 3, 1, 2, 1]$. The number on the second position is 2.

In the second sample the obtained sequence is $[1, 2, 1, 3, 1, 2, 1, 4, 1, 2, 1, 3, 1, 2, 1]$. The number on the eighth position is 4.

C. Vladik and fractions

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

Vladik and Chloe decided to determine who of them is better at math. Vladik claimed that for any positive integer n he can represent fraction as a sum of three distinct positive fractions in form .

Help Vladik with that, i.e for a given n find three distinct positive integers x, y and z such that . Because Chloe can't check Vladik's answer if the numbers are large, he asks you to print numbers not exceeding 10^9.

If there is no such answer, print `-1`.

Input

The single line contains single integer n ($1 \le n \le 10^4$).

Output

If the answer exists, print 3 distinct numbers x, y and z ($1 \le x, y, z \le 10^9$, $x \ne y$, $x \ne z$, $y \ne z$). Otherwise print `-1`.

If there are multiple answers, print any of them.

Examples

input
```
3
```
output
```
2 7 42
```

input
```
7
```
output
```
7 8 56
```

D. Chloe and pleasant prizes

time limit per test: 2 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

Generous sponsors of the olympiad in which Chloe and Vladik took part allowed all the participants to choose a prize for them on their own. Christmas is coming, so sponsors decided to decorate the Christmas tree with their prizes.

They took n prizes for the contestants and wrote on each of them a unique id (integer from 1 to n). A gift i is characterized by integer a_i — pleasantness of the gift. The pleasantness of the gift can be positive, negative or zero. Sponsors placed the gift 1 on the top of the tree. All the other gifts hung on a rope tied to some other gift so that each gift hung on the first gift, possibly with a sequence of ropes and another gifts. Formally, the gifts formed a rooted tree with n vertices.

The prize-giving procedure goes in the following way: the participants come to the tree one after another, choose any of the remaining gifts and cut the rope this prize hang on. Note that all the ropes which were used to hang other prizes on the chosen one are not cut. So the contestant gets the chosen gift as well as the all the gifts that hang on it, possibly with a sequence of ropes and another gifts.

Our friends, Chloe and Vladik, shared the first place on the olympiad and they will choose prizes at the same time! To keep themselves from fighting, they decided to choose two different gifts so that the sets of the gifts that hang on them with a sequence of ropes and another gifts don't intersect. In other words, there shouldn't be any gift that hang both on the gift chosen by Chloe and on the gift chosen by Vladik. From all of the possible variants they will choose such pair of prizes that the sum of pleasantness of all the gifts that they will take after cutting the ropes is as large as possible.

Print the maximum sum of pleasantness that Vladik and Chloe can get. If it is impossible for them to choose the gifts without fighting, print `Impossible`.

Input

The first line contains a single integer n ($1 \le n \le 2 \cdot 10^5$) — the number of gifts.

The next line contains n integers $a_1, a_2, ..., a_n$ ($-10^9 \le a_i \le 10^9$) — the pleasantness of the gifts.

The next $(n - 1)$ lines contain two numbers each. The i-th of these lines contains integers u_i and v_i ($1 \le u_i, v_i \le n$, $u_i \ne v_i$) — the description of the tree's edges. It means that gifts with numbers u_i and v_i are connected to each other with a rope. The gifts' ids in the description of the ropes can be given in arbitrary order: v_i hangs on u_i or u_i hangs on v_i.

It is guaranteed that all the gifts hang on the first gift, possibly with a sequence of ropes and another gifts.

Output

If it is possible for Chloe and Vladik to choose prizes without fighting, print single integer — the maximum possible sum of pleasantness they can get together.

Otherwise print `Impossible`.

Examples

input

```
8
0 5 -1 4 3 2 6 5
1 2
2 4
2 5
1 3
3 6
6 7
6 8
```

output

```
25
```

input

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

output

```
2
```

input

```
1
-1
```

output

```
Impossible
```

E. Vladik and cards

time limit per test: 2 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

Vladik was bored on his way home and decided to play the following game. He took n cards and put them in a row in front of himself. Every card has a positive integer number not exceeding 8 written on it. He decided to find the longest subsequence of cards which satisfies the following conditions:

- the number of occurrences of each number from 1 to 8 in the subsequence doesn't differ by more then 1 from the number of occurrences of any other number. Formally, if there are c_k cards with number k on them in the subsequence, than for all pairs of integers the condition $|c_i - c_j| \le 1$ must hold.
- if there is at least one card with number x on it in the subsequence, then all cards with number x in this subsequence must form a continuous segment in it (**but not necessarily a continuous segment in the original sequence**). For example, the subsequence $[1, 1, 2, 2]$ satisfies this condition while the subsequence $[1, 2, 2, 1]$ doesn't. Note that $[1, 1, 2, 2]$ doesn't satisfy the first condition.

Please help Vladik to find the length of the longest subsequence that satisfies both conditions.

Input

The first line contains single integer n $(1 \le n \le 1000)$ — the number of cards in Vladik's sequence.

The second line contains the sequence of n positive integers not exceeding 8 — the description of Vladik's sequence.

Output

Print single integer — the length of the longest subsequence of Vladik's sequence that satisfies both conditions.

Examples

input

```
3
1 1 1
```

output

```
1
```

input

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

output

```
8
```

input

```
24
1 8 1 2 8 2 3 8 3 4 8 4 5 8 5 6 8 6 7 8 7 8 8 8
```

output

```
17
```

Note

In the first sample all the numbers written on the cards are equal, so you can't take more than one card, otherwise you'll violate the first condition.