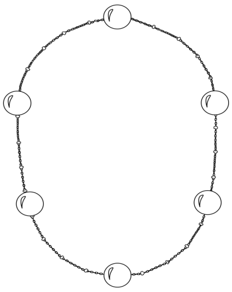
Codeforces Round #480 (Div. 2)

A. Links and Pearls

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

A necklace can be described as a string of links ('-') and pearls ('o'), with the last link or pearl connected to the first one.



You can remove a link or a pearl and insert it between two other existing links or pearls (or between a link and a pearl) on the necklace. This process can be repeated as many times as you like, but you can't throw away any parts.

Can you make the number of links between every two adjacent pearls equal? Two pearls are considered to be adjacent if there is no other pearl between them.

Note that the final necklace should remain as one circular part of the same length as the initial necklace.

Input

The only line of input contains a string $$$s$$$ ($$$3 \leq |s| \leq 100$$$), representing the necklace, where a dash '-' represents a link and the lowercase English letter 'o' represents a pearl.

Output

Print "YES" if the links and pearls can be rejoined such that the number of links between adjacent pearls is equal. Otherwise print "NO".

You can print each letter in any case (upper or lower).

Examples

input
```
-o-o--
```
output
```
YES
```

input
```
-o---
```
output
```
YES
```

input
```
-o---o-
```
output
```
NO
```

input
```
ooo
```
output
```
YES
```

B. Marlin

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

output: standard output

The city of Fishtopia can be imagined as a grid of 4 rows and an **odd** number of columns. It has two main villages; the first is located at the top-left cell $(1,1)$, people who stay there love fishing at the Tuna pond at the bottom-right cell $(4, n)$. The second village is located at $(4, 1)$ and its people love the Salmon pond at $(1, n)$.

The mayor of Fishtopia wants to place k hotels in the city, each one occupying one cell. To allow people to enter the city from anywhere, hotels should not be placed on the border cells.

A person can move from one cell to another if those cells are not occupied by hotels and share a side.

Can you help the mayor place the hotels in a way such that there are equal number of shortest paths from each village to its preferred pond?

Input

The first line of input contain two integers, n and k ($3 \leq n \leq 99$, $0 \leq k \leq 2\times(n-2)$), n is **odd**, the width of the city, and the number of hotels to be placed, respectively.

Output

Print "`YES`", if it is possible to place all the hotels in a way that satisfies the problem statement, otherwise print "`NO`".

If it is possible, print an extra 4 lines that describe the city, each line should have n characters, each of which is "`#`" if that cell has a hotel on it, or "`.`" if not.

Examples

input

```
7 2
```

output

```
YES
.......
.#.....
.#.....
.......
```

input

```
5 3
```

output

```
YES
.....
.###.
.....
.....
```

C. Posterized

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

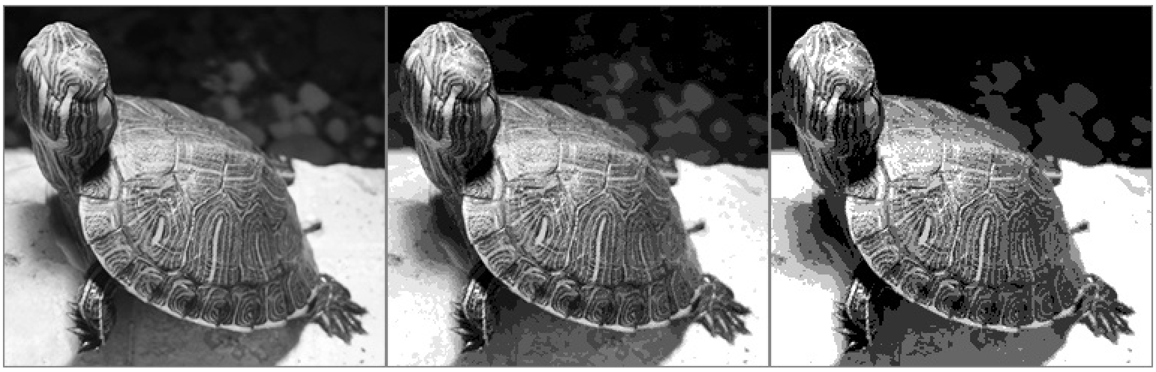
Professor Ibrahim has prepared the final homework for his algorithm's class. He asked his students to implement the Posterization Image Filter.

Their algorithm will be tested on an array of integers, where the i-th integer represents the color of the i-th pixel in the image. The image is in black and white, therefore the color of each pixel will be an integer between 0 and 255 (inclusive).

To implement the filter, students are required to divide the black and white color range [0, 255] into groups of consecutive colors, and select one color in each group to be the group's key. In order to preserve image details, the size of a group must not be greater than k, and each color should belong to exactly one group.

Finally, the students will replace the color of each pixel in the array with that color's assigned group key.

To better understand the effect, here is an image of a basking turtle where the Posterization Filter was applied with increasing k to the right.



To make the process of checking the final answer easier, Professor Ibrahim wants students to divide the groups and assign the keys in a way that produces the lexicographically smallest possible array.

Input

The first line of input contains two integers n and k ($1 \leq n \leq 10^5$, $1 \leq k \leq 256$), the number of pixels in the image, and the maximum size of a group, respectively.

The second line contains n integers $p_1, p_2, \dots, p_n$ ($0 \leq p_i \leq 255$), where p_i is the color of the i-th pixel.

Output

Print n space-separated integers; the lexicographically smallest possible array that represents the image after applying the Posterization filter.

Examples

input

```
4 3
2 14 3 4
```

output

```
0 12 3 3
```

input

```
5 2
0 2 1 255 254
```

output

```
0 1 1 254 254
```

Note

One possible way to group colors and assign keys for the first sample:

Color 2 belongs to the group $[0,2]$, with group key 0.

Color 14 belongs to the group $[12,14]$, with group key 12.

Colors 3 and 4 belong to group $[3, 5]$, with group key 3.

Other groups won't affect the result so they are not listed here.

D. Perfect Groups

time limit per test: 1 second

memory limit per test: 256 megabytes

input: standard input

output: standard output

SaMer has written the greatest test case of all time for one of his problems. For a given array of integers, the problem asks to find the minimum number of groups the array can be divided into, such that the product of any pair of integers in the same group is a perfect square.

Each integer must be in exactly one group. However, integers in a group do not necessarily have to be contiguous in the array.

SaMer wishes to create more cases from the test case he already has. His test case has an array A of n integers, and he needs to find the number of contiguous subarrays of A that have an answer to the problem equal to k for each integer k between 1 and n (inclusive).

Input

The first line of input contains a single integer n ($1 \leq n \leq 5000$), the size of the array.

The second line contains n integers a_1,a_2,$\dots$,a_n ($-10^8 \leq a_i \leq 10^8$), the values of the array.

Output

Output n space-separated integers, the k-th integer should be the number of contiguous subarrays of A that have an answer to the problem equal to k.

Examples

input

```
2
5 5
```

output

```
3 0
```

input

```
5
5 -4 2 1 8
```

output

```
5 5 3 2 0
```

input

```
1
0
```

output

```
1
```

E. The Number Games

time limit per test: 3 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

The nation of Panel holds an annual show called The Number Games, where each district in the nation will be represented by one contestant.

The nation has n districts numbered from 1 to n, each district has exactly one path connecting it to every other district. The number of fans of a contestant from district i is equal to 2^i.

This year, the president decided to reduce the costs. He wants to remove k contestants from the games. However, the districts of the removed contestants will be furious and will not allow anyone to cross through their districts.

The president wants to ensure that all remaining contestants are from districts that can be reached from one another. He also wishes to maximize the total number of fans of the participating contestants.

Which contestants should the president remove?

Input

The first line of input contains two integers n and k ($1 \leq k < n \leq 10^6$) — the number of districts in Panel, and the number of contestants the president wishes to remove, respectively.

The next $n-1$ lines each contains two integers a and b ($1 \leq a, b \leq n$, $a \ne b$), that describe a road that connects two different districts a and b in the nation. It is guaranteed that there is exactly one path between every two districts.

Output

Print k space-separated integers: the numbers of the districts of which the contestants should be removed, **in increasing order of district number**.

Examples

input

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

output

```
1 3 4
```

input

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

output

```
1 3 4 5
```

Note

In the first sample, the maximum possible total number of fans is $2^2 + 2^5 + 2^6 = 100$. We can achieve it by removing the contestants of the districts 1, 3, and 4.

F. Cactus to Tree

time limit per test: 4 seconds
memory limit per test: 256 megabytes

input: standard input
output: standard output

You are given a special connected undirected graph where each vertex belongs to at most one simple cycle.

Your task is to remove as many edges as needed to convert this graph into a tree (connected graph with no cycles).

For each node, independently, output the maximum distance between it and a leaf in the resulting tree, assuming you were to remove the edges in a way that minimizes this distance.

Input

The first line of input contains two integers n and m ($1 \leq n \leq 5\cdot 10^5$), the number of nodes and the number of edges, respectively.

Each of the following m lines contains two integers u and v ($1 \leq u,v \leq n$, $u \ne v$), and represents an edge connecting the two nodes u and v. Each pair of nodes is connected by at most one edge.

It is guaranteed that the given graph is connected and each vertex belongs to at most one simple cycle.

Output

Print n space-separated integers, the i-th integer represents the maximum distance between node i and a leaf if the removed edges were chosen in a way that minimizes this distance.

Examples

input

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

output

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

input

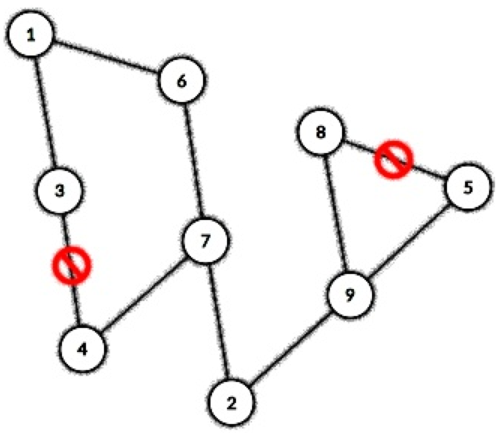
```
4 4
1 2
2 3
3 4
4 1
```

output

```
2 2 2 2
```

Note

In the first sample, a possible way to minimize the maximum distance from vertex 1 is by removing the marked edges in the following image:



Note that to minimize the answer for different nodes, you can remove different edges.