B. Chat

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

There are times you recall a good old friend and everything you've come through together. Luckily there are social networks — they store all your message history making it easy to know what you argued over 10 years ago.

More formal, your message history is a sequence of messages ordered by time sent numbered from 1 to n where n is the total number of messages in the chat.

Each message might contain a link to an earlier message which it is a reply to. When opening a message x or getting a link to it, the dialogue is shown in such a way that k previous messages, message x and k next messages are visible (with respect to message x). In case there are less than k messages somewhere, they are yet all shown.

Digging deep into your message history, you always read all visible messages and then go by the link in the current message x (if there is one) and continue reading in the same manner.

Determine the number of messages you'll read if your start from message number t for all t from 1 to n. Calculate these numbers independently. If you start with message x, the initial configuration is x itself, k previous and k next messages. Messages read multiple times are considered as one.

Input

The first line contains two integers n and k ($1 \le n \le 10^5$, $0 \le k \le n$) — the total amount of messages and the number of previous and next messages visible.

The second line features a sequence of integers $a_1, a_2, ..., a_n$ ($0 \le a_i < i$), where a_i denotes the i-th message link destination or zero, if there's no link from i. All messages are listed in chronological order. It's guaranteed that the link from message x goes to message with number strictly less than x.

Output

Print n integers with i-th denoting the number of distinct messages you can read starting from message i and traversing the links while possible.

Examples

input
6 0 0 1 1 2 3 2
output
1 2 2 3 3 3

input
10 1 0 1 0 3 4 5 2 3 7 0
output
2 3 3 4 5 6 6 6 8 2

input
2 2 0 1
output

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2 2
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Note

Consider $i = 6$ in sample case one. You will read message 6, then 2, then 1 and then there will be no link to go.

In the second sample case $i = 6$ gives you messages $5, 6, 7$ since $k = 1$, then $4, 5, 6$, then $2, 3, 4$ and then the link sequence breaks. The number of distinct messages here is equal to 6.