Problem C. Image Processing

Input file: `standard input`
Output file: `standard output`

Brabo has n images and an image processing APP. The i-th image, for any $1 \leq i \leq n$, has a contrast value v_i. To make the images better, the APP receives a batch of images together (which contains at least k images) and the contrast between these images should be as close as possible.

Brabo has already known the contrast values v_i of all these images, and now he has to determine a partition splitting images into groups so that each group has at least k images, and each image should belong to a certain group. Moreover, the maximal difference of contrast values for images in the same group should be as small as possible. Note that Brabo cannot rearrange the order of these images. That is, each group must contain several images with continuous indexes.

Let's denote c_i as the smallest maximal difference of contrast values for splitting the first i images into groups. Your task is to compute these values: $c_1, c_2, \cdots, c_n$. Note that when it is impossible to partition the first i images, c_i is regarded as 0.

Input

The first line contains two integers n ($1 \leq n \leq 1000000$) and k ($1 \leq k \leq n$) — the number of images, and each group of images should contain no less than k images.

The next line contains n integers $x_1, x_2, \cdots, x_n$ ($0 \leq x_i \leq 2 \times 10^9$) — the encrypted contrast v_i of these images. The actual v_i is $x_i \oplus c_{i-1}$, where $\oplus$ denotes bitwise exclusive-or. Note that $c_0 = 0$. It is guaranteed that $1 \leq v_i \leq 10^9$ after decryption.

Output

Output n lines, where the i-th ($1 \leq i \leq n$) line contains a single integer, the smallest contrast differences c_i.

Example

standard input	standard output
5 2 50 110 190 120 34	0 60 80 90 80

Note

In the sample test, $v = [50, 110, 130, 40, 120]$.