K-rep Array

Input file:	`standard input`
Output file:	`standard output`
Time limit:	2 seconds
Memory limit:	1024 megabytes

For a positive integer K, a sequence V consisting of positive integers is said to be K-rep if it satisfies the following condition:

- There exists a sequence B of length K consisting of positive integers, such that the sequence B' obtained by repeating B for 10^{100} times contains V as a contiguous subsequence.

You are given a sequence $A = (A_1, A_2, \ldots, A_N)$ of length N, where each element is either a positive integer or -1. For each $K = 1, 2, \ldots, N$, solve the following problem:

- Determine whether there exists a replacement of each -1 in A with a positive integer such that the resulting sequence is K-rep.

Input

The input is given in the following format:

```
N
A_1 A_2 ... A_N
```

- All inputs are integers.
- $1 \le N \le 2 \times 10^5$.
- $1 \le A_i \le N$ or $A_i = -1$ for each i.

Output

Output a string of length N. The i-th character should be `1` if there exists a replacement satisfying the condition for the case $K = i$, and `0` otherwise.

Example

standard input	standard output
5	01011
1 2 -1 2 1	

Note

In the example, one possible replacement of the elements $A_i = -1$ is the sequence $(1, 2, 3, 2, 1)$. For $K = 4$, let $B = (2, 3, 2, 1)$. Since the sequence B' obtained by repeating B contains $(1, 2, 3, 2, 1)$ as a contiguous subsequence, $(1, 2, 3, 2, 1)$ is K-rep.