Problem K
Tree Quiz
Time limit: 4 seconds

Your friend wants to quiz you. You are given a *rooted tree* with n nodes, numbered from 1 to n. For every node i, its parent is node p_i, except for the *root* (the node without a parent) which has $p_i = 0$. Node u is an *ancestor* of node v if either $u = v$, or node u is an ancestor of the parent of node v (if it exists).

We say that node z is a *common ancestor* of nodes x and y if node z is an ancestor of both nodes x and y. We say that node z is the *lowest common ancestor* of nodes x and y if it is a common ancestor of nodes x and y, and every common ancestor of nodes x and y is also an ancestor of node z. We denote the lowest common ancestor of nodes x and y by $\mathrm{LCA}(x, y)$. In particular, $\mathrm{LCA}(x, x) = x$.

Your friend would like to run the following pseudocode:

```
let L be an empty array
for x = 1 to n
  for y = 1 to n
    append ((x - 1) * n * n + (LCA(x, y) - 1) * n + (y - 1)) to L
sort L in non-decreasing order
```

Your friend has q questions, numbered from 1 to q. In question j, you are given an integer k_j and asked to find the k_j-th element of the array L. Note that L is 1-indexed, so the indices range from 1 to n^2, inclusive. To pass the quiz, you have to answer all of the questions.

Input

The first line of input contains two integers n and q ($1 \le n \le 100\,000$; $1 \le q \le 100\,000$). The second line contains n integers $p_1, p_2, \ldots, p_n$ ($0 \le p_i \le n$ for all i). It is guaranteed that the given values represent a rooted tree. Each of the next q lines contains an integer. The j-th line contains k_j ($1 \le k_j \le n^2$).

Output

For each question in order, output an integer representing the answer to the question.

Sample Input #1	Sample Output #1
5 3 3 0 2 2 3 1 18 25	0 82 124

Explanation for the sample input/output #1

The tree in the input is illustrated by Figure K.1.

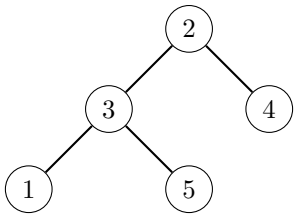


Figure K.1: Illustration of the tree in sample input #1.

The elements of L are
$(0, 6, 8, 12, 14, 30, 31, 32, 33, 34, 56, 58, 60, 62, 64, 80, 81, 82, 84, 93, 106, 108, 110, 112, 124)$.