6447 Digital Content Protection

Picture from Wikimedia Commons

Dan is working for a digital content protection company, which is responsible for the content protection of blu-ray discs based on a standard called Anti Content Misuse (ACM).

The ACM standard works as follows. Assume there are 2^n blu-ray drives/players. We represent these 2^n drives as the leaves of a complete binary tree of height n, so that each root-to-leaf path consists of n edges. Each node u in this binary tree is assigned an identifier number and contains a random key k_u. The identifier numbers are assigned as follows. The root, r, is assigned 1. In addition, the left and right children of an internal node having number i are assigned numbers $2i$ and $2i + 1$, respectively. This scheme assigns a distinct number to each node in the tree. The keys contained in the nodes are unknown to blu-ray users, but they are available to blu-ray drive manufacturers. Each blu-ray player is assigned the identifier number i ($2^n \leq i \leq 2^{n+1} - 1$) of its corresponding leaf in the tree. A manufacturer of blu-ray drives embeds the keys associated with the nodes in the path from the root to leaf number i in player number i.

To encrypt the content of a blu-ray disc, the company in charge creates a random key k called the master key. First, they encrypt k with the key k_r (recall r is the root node of binary tree) and write it on the disc as a header. Then, they encrypt the content with k, and write the encrypted data on the blu-ray disc. A blu-ray drive first decrypts the header using key k_r embedded in it and recovers the master key k and then, decrypts the content using the key k.

Unfortunately, the keys embedded in a set of blu-ray drives, R, are exposed by hackers and published on the web. As a result, we cannot encrypt the master key k using any of these exposed keys. For example, since all blu-ray drives contain k_r, the encryption scheme above does not work any more. There is a solution oversaw for this situation in the ACM standard. At the cost of a larger header, the industry can safely encrypt the content of a new blu-ray disc. They carefully choose a subset of unexposed keys K in the binary tree such that all blu-ray drives, except for drives in R, have at least one of the keys in K. They encrypt the master key k with each key $k' \in K$ and put the result in the header (i.e., there are $|K|$ ciphertexts in the header). Now, each active blu-ray drive can decrypt at least one of the ciphertexts in the header and can recover the master key k. Dan needs your help to determine a subset of keys K with minimum cardinality (which results in the smallest header) given the identifiers of hacked drives.

Input

The input file contains several test cases, each of them as described below.

A test case consists of two lines. The first line contains two integers n and $|R|$, where $1 \leq n \leq 62$ and $1 \leq |R| \leq 1000$. $|R|$ is the cardinality of R, the set of exposed drives. The second line contains $|R|$ integers, which are the identifiers of exposed blu-ray drives. You can assume that there is at least one blu-ray drive not hacked.

Output

For each test case, display, on a line by itself, the identifiers of nodes corresponding to the keys in K, satisfying the above requirements and having minimum cardinality, in increasing order and separated with single spaces.

Sample Input

```
2 1
5
3 3
10 11 12
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Sample Output

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3 4
4 7 13
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