

C. Cryptography

Given three arrays f, g, h of length 2^m , Bobo defines a cryptographic function $\text{enc}(x, y) = (a, b)$ where

- $a = y \oplus g[x \oplus f[y]]$,
- $b = x \oplus f[y] \oplus h[y \oplus g[x \oplus f[y]]]$.

He also has q questions $(a_1, b_1), \dots, (a_q, b_q)$.

For each (a_i, b_i) , find a pair of integers (x, y) where $0 \leq x, y < 2^m$ and $\text{enc}(x, y) = (a_i, b_i)$. It is guaranteed that for each (a_i, b_i) , there exists a **unique** pair (x, y) satisfying the condition.

Note: \oplus denotes the bitwise exclusive-or, i.e., xor.

Input

The input consists of several test cases terminated by end-of-file. For each test case,

The first line contains two integers m and q .

The second line contains 2^m integers $f[0], \dots, f[2^m - 1]$.

The third line contains 2^m integers $g[0], \dots, g[2^m - 1]$.

The fourth line contains 2^m integers $h[0], \dots, h[2^m - 1]$.

For the following q lines, the i -th line contains two integers a_i and b_i .

- $1 \leq m \leq 16$
- $1 \leq q \leq 10^5$
- $0 \leq f[i], g[i], h[i] < 2^m$ for each $0 \leq i < 2^m$
- $0 \leq a_i, b_i < 2^m$ for each $1 \leq i \leq q$
- In each input, the sum of 2^m does not exceed 10^5 . The sum of q does not exceed 10^5 .

Output

For each question, output two integers which denote the found x and y .

Sample Input

```
2 2
0 1 2 3
1 2 3 0
2 3 0 1
0 1
2 3
1 1
0 0
0 0
0 0
0 0
```

Sample Output

```
3 0
1 2
0 0
```