Problem D. Convolution

Input file:	convolution.in
Output file:	convolution.out
Time limit:	2 second
Memory limit:	256 mebibytes

Consider all subsets of set $U = \{0, 1, 2, \ldots, n-1\}$. Every subset $A = \{a_1, a_2, \ldots, a_k\}$ corresponds to a unique integer $p(A) = \sum_{i=1}^{k} 2^{a_i}$. Let function F of an n-element set be defined by an array of integers f of length 2^n: the value $F(A)$ is equal to $f[p(A)]$.

You are given two functions F and G. Your task is to find such function H that

$$H(A) = \sum_{B \cup C = A} F(B)G(C).$$

Input

The first line contains two integers n and t ($1 \le n \le 16$, $1 \le t \le 100$). Here, n is the size of the set U, and t is number of test cases. The second line contains two integers a and b, each from 1 to 10^9. These numbers are used in the following pseudo-random generator:

```
1. unsigned int cur = 0; // unsigned 32-bit integer
2. unsigned int nextRand16() {
3.     cur = cur * a + b; // calculated modulo 2^32
4.     return cur / 2^16; // integer from 0 to 2^16 - 1
5. }
```

The test cases are generated successively. In each of them, first, you must generate the elements of array f (values of F) in the order of increasing array index, and after that, you must generate the elements of g (values of G) in the same order. Each element is generated by calling the function `nextRand16()`.

Output

For each test case, print one integer on a separate line: $\left(\sum_A H(A) \cdot (p(A)+1)\right) \bmod 2^{32}$.

Examples

convolution.in	convolution.out
3 2 30 239017	2723387430 3167905008
16 2 239 17	551267264 1632349120

Explanations

The arrays in the first example are the following:

f_1: 3, 113, 3395, 36331, 41370, 61471, 9130, 11774

g_1: 25547, 45526, 55066, 13590, 14501, 41817, 9356, 18543

h_1: 76641, 8167827, 273846333, 5284992017, 1656829263, 11450721456, 3699971823, 14260048942

f_2: 32024, 43238, 51978, 52034, 53714, 38578, 43250, 52338

g_2: 62834, 50034, 59250, 8050, 44914, 36722, 53106, 20338

h_2: 2012196016, 6482475400, 8243104152, 15561662464, 7225902008, 16869349792, 22350138288, 44342816072