NOI '14 P5 - Random Number Generator

Time limit: 2.0s **Memory limit:** 256M

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Little H has recently been studying randomized algorithms. Randomized algorithms often use random number generation functions (e.g. `random` from Pascal and `rand` from C/C++) to obtain their randomness. In reality, random number functions are not truly "random." Instead, they work off of some specific algorithms.

As such, the following recursive quadratic polynomial is one method:

The algorithm selects nonnegative integers x_0, a, b, c, and d as its seed values and uses the following recursive calculations to generate a random number.

For any $i \geq 1$, $x_i = (a \times x_{i-1}^2 + b \times x_{i-1} + c) \bmod d$.

This way, a sequence of nonnegative integers $\{x_i\}_{i \geq 1}$ of arbitrary length can be obtained. Typically, we can consider this sequence to be random. Using the sequence $\{x_i\}_{i \geq 1}$, we can use the following algorithm to produce $\{T_i\}_{i=1}^{K}$, a random permutation of the numbers 1 to K.

1. Initialize T to the sequence of integers from 1 to K.
2. Perform K swaps on the sequence T. The i-th swap will swap the value of T_i with the value of $T_{(x_i \bmod i)+1}$.

Outside of this base number of K swaps, little H has made **an additional** Q swaps. For the i-th additional swap, little H will choose two positions u_i and v_i and swap the values of T_{u_i} and T_{v_i}.

To check the effectiveness of the random permutation generator, little H designed the following problem:

Little H has an N row by M column grid. She initially follows the above process, producing a random permutation $\{T_i\}_{i=1}^{N \times M}$ of the integers from 1 to $N \times M$ after $N \times M + Q$ swaps. Then these $N \times M$ values are then placed back into the grid, row for row, column for column. That is, the cell at column j of row i in the original grid will now take on the value of $T_{(i-1) \times M + j}$.

Afterwards, little H wishes to start from the top-left corner of the grid (i.e. row 1, column 1), **each step moving either right or down under the precondition that she does not move outside of the grid**, and reach the bottom-right corner (i.e. row N, column M).

Little H writes down the value of every cell she travels through, **ordered from least to greatest**. This way, for any valid path, little H can obtain an increasing sequence of length $N + M - 1$ which we will call the **path sequence**. Little H wishes to know the **lexicographically smallest** path sequence that she can obtain.

Input Specification

Line 1 of input consists of five integers x_0, a, b, c, and d, representing the seed values to little H's random number generator.
Line 2 of input consists of three integers N, M, and Q, indicating that little H generates a permutation from 1 to $N \times M$ to fill her $N \times M$ grid. Also, after little H performs her $N \times M$ swaps, she will perform an additional Q swaps.

The final Q lines will each contain two integers u_i and v_i, indicating that the i-th additional swap involves swapping T_{u_i} and T_{v_i}.

Output Specification

The output should consist of one line containing $N + M - 1$ space-separated positive integers, representing the lexicographically smallest path sequence that little H can obtain.

Sample Input 1

```
1 3 5 1 71
3 4 3
1 7
9 9
4 9
```

Sample Output 1

```
1 2 6 8 9 12
```

Sample Input 2

```
654321 209 111 23 70000001
10 10 0
```

Sample Output 2

```
1 3 7 10 14 15 16 21 23 30 44 52 55 70 72 88 94 95 97
```

Sample Input 3

```
123456 137 701 101 10000007
20 20 0
```

Sample Output 3

```
1 10 12 14 16 26 32 38 44 46 61 81 84 101 126 128 135 140 152 156 201 206 237 242 243 253 259
269 278 279 291 298 338 345 347 352 354 383 395
```

Explanation

For sample 1, according to the input seed values, the first 12 random numbers of x_i are:
`9 5 30 11 64 42 36 22 1 9 5 30`
With these 12 random numbers, little H will perform 12 swap operations, yielding the following:
`6 9 1 4 5 11 12 2 7 10 3 8`
After the additional 3 swap operations, little H obtains the final permuted sequence of:
`12 9 1 7 5 11 6 2 4 10 3 8`
This sequence will yield the following grid.

12	9	1	7
5	11	6	2
4	10	3	8

The optimal path sequence is: $12 \to 9 \to 1 \to 6 \to 2 \to 8$.

Constraints

The constraints of all the test cases are outlined below.

Test Case	N, M	Q	Other Constraints

1	$2 \leq N, M \leq 8$	$Q = 0$	$0 \leq a \leq 300$ $0 \leq b, c \leq 10^8$ $0 \leq x_0 < d \leq 10^8$ $1 \leq u_i, v_i \leq N \times M$
2	$2 \leq N, M \leq 200$		
3			
4	$2 \leq N, M \leq 2000$	$0 \leq Q \leq 50\,000$	
5			
6			
7	$2 \leq N, M \leq 5000$		
8			
9			
10			

Problem translated to English by **Alex**.