111-2 Data Structure

Homework 4 – Linked List

Question 1 (90%)

You are given two integers rows and cols, which represent the dimensions of a terrarium.

There is a snake in the terrarium who swallowed too much rats, which makes it feel nauseous and want to vomit.

You are given the head of a linked list of integers which represents the weight of the rats inside the snake's stomach (from its head to its tail).

Starting from the **top-left** corner of the terrarium, the snake starts vomiting and crawling **clockwise** inside the terrarium, and it will not crawl through the path where it has crawled.

Please generate a rows * cols matrix containing the weight of each rat vomited by the snake in the terrarium. If there are remaining empty spaces, fill them with -1.

Input format

Please read the input from **STDIN**. The first line of a test case has 2 integers rows, cols, representing the dimensions of the terrarium. The second line contains an integer numOfRats, which represents the number of rats swallowed by the snake. The third line contains numOfRats integers representing the weight of the rats.

Constraints

- 1 <= rows, cols <= 10^5
- 1 <= rows * cols <= 10^5
- 1 <= numOfRats <= rows * cols
- 1 <= weight of a rat <= 1000

Output format

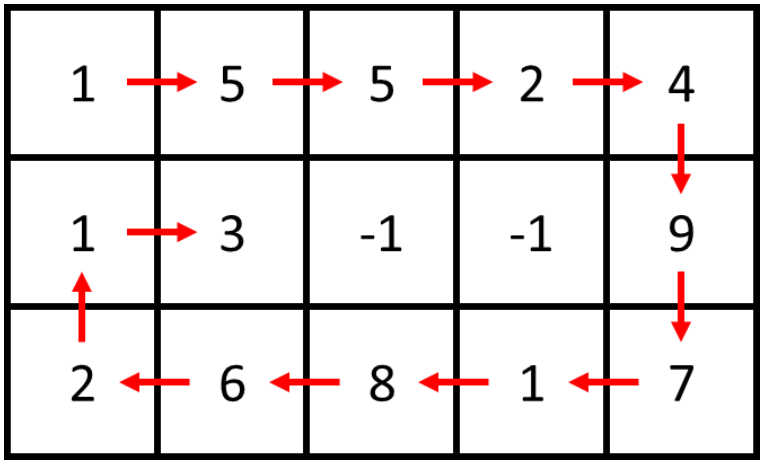
Please print a rows * cols matrix to **STDOUT**, each row is separated by a new line, and each number in a row is separated by a space.
DO NOT print anything else except for the answer.

Sample input 1

```
3 5
13
1 5 5 2 4 9 7 1 8 6 2 1 3
```

Sample output 1

```
1 5 5 2 4
1 3 -1 -1 9
2 6 8 1 7
```

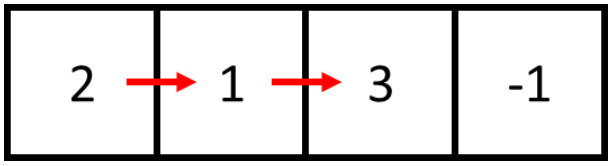


Sample input 2

```
1 4
3
2 1 3
```

Sample output 2

```
2 1 3 -1
```



Question 2 (10%)

Continuing from **Question 1**, now the snake will digest the rat at the middle of the remaining rats in its stomach every digestInterval vomits, so the rat digested by the snake won't be vomited. If there are two rats at the middle, the one **near the tail** will be digested.

Please generate a rows * cols matrix containing the weight of each rat vomited by the snake in the terrarium. If there are remaining empty spaces, fill them with -1.

Input format

Please read the input from **STDIN**. The first line of a test case has 2 integers rows, cols, representing the dimensions of the terrarium. The second line contains an integer numOfRats, which represents the number of rats swallowed by the snake. The third line contains numOfRats integers representing the weight of the rats. The last line contains an integer digestInterval, representing the interval of the digestion.

Constraints

- 1 <= rows, cols <= 10^5
- 1 <= rows * cols <= 10^5
- 1 <= numOfRats <= rows * cols
- 1 <= weight of a rat <= 1000
- 1 <= digestInterval < numOfRats

Output format

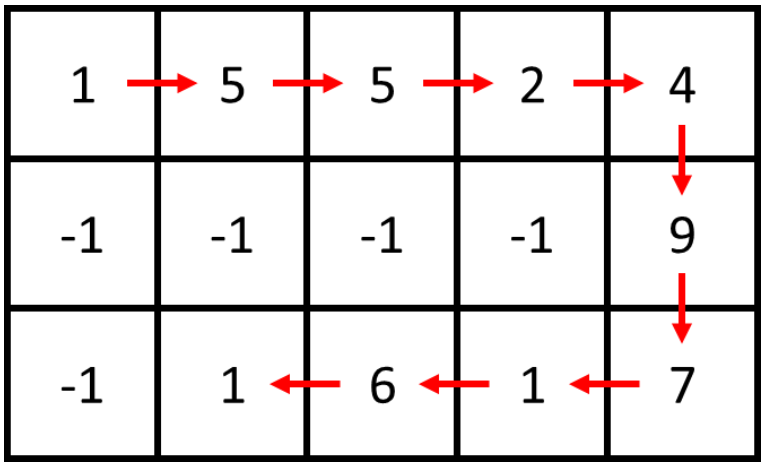
Please print a rows * cols matrix to **STDOUT**, each row is separated by a new line, and each number in a row is separated by a space.
DO NOT print anything else except for the answer.

Sample input 1

```
3 5
13
1 5 5 2 4 9 7 1 8 6 2 1 3
3
```

Sample output 1

```
1 5 5 2 4
-1 -1 -1 -1 9
-1 1 6 1 7
```



Explanation 1

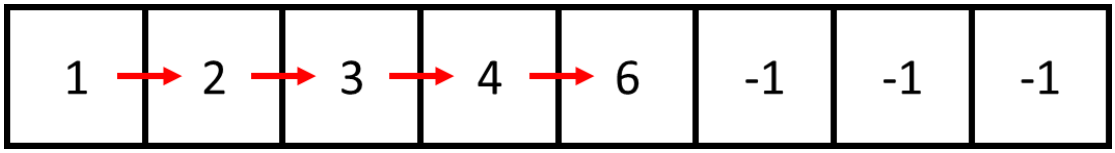
Start: 1 5 5 2 4 9 7 1 8 6 2 1 3
Vomit: 1 -> 5 -> 5
Digest: 2 4 9 7 1 **8** 6 2 1 3
Vomit: 2 -> 4 -> 9
Digest: 7 1 6 **2** 1 3
Vomit: 7 -> 1 -> 6
Digest: 1 **3**
Vomit: 1

Sample input 2

```
1 8
7
1 2 3 4 5 6 7
2
```

Sample output 2

```
1 2 3 4 6 -1 -1 -1
```



Explanation 2

Start: 1 2 3 4 5 6 7

Vomit: 1 -> 2

Digest: 3 4 **5** 6 7

Vomit: 3 -> 4

Digest: 6 **7**

Vomit: 6

Grading

Each question has **5 test cases**, and you'll get **0.2*the total score of the question** if you pass 1 test case of the question.

Please do not plagiarize, or you'll get 0 point.

Notes

- Please avoid commenting in **Chinese**, it might cause compiling problem.
- Please comment the code which could produce redundant outputs, e.g., input prompt, debug message, system call, etc.
- You can assume the test cases are designed according to the constraints, you don't have to handle the exceptions.
- Your code must terminate after printing the answer, do not use an infinite loop to get another test case input.

Submission

You can only use C/C++ to write the program.

You have to download the **sample code** from E3 and finish the implementation. You **MUST NOT** modify the code inside the **main function** and the **struct Snake**. Adding custom function is allowed.

Please name your files as Q{question_id}_{student_id}, for example:

- Q1_123456.c or Q1_123456.cpp
- Q2_123456.c or Q2_123456.cpp

and then upload your files to E3.

If you have any questions, please send an e-mail to the teacher and all the TAs **via E3**.