Problem A. pr0hum and the Weekend

Input file: standard input
Output file: standard output
Time limit: 1 second
Memory limit: 512 megabytes

The Weekend is around the corner, and pr0hum and his friends are throwing a party because, Happy Weekend, for which they have invited n guests to the party numbered from 1 to n

For an unknown experiment made up just for the sake of this question, pr0hum wants to collect some data and has gathered a list of m entires of who follows whom on Instagram. For example, if one entry in the list is a b, it implies a follows b.

Before the party starts, pr0hum wants you to arrange the data so that he can later work in peace. He wants you to print n lines where the i^{th} line would contain all the people person i follows.

Input

The first line contains two integers n, m. The number of guests invited to the party and the number of entries in the list which pr0hum has.

The next m lines have two integers u, v. Implying Guest u follows Guest v.

$2 \le n \le 10^5$

$1 \le m \le 2 * 10^5$

$1 \le u, v \le n$

Output

Print n lines, where the i^{th} line has all the people person i follows.

Print the People person i follows in the order given in the list of entries, i.e. if a b comes before a c then in the a^{th} line of the output, b will come before c.

If someone follows no one print -1 for them.

Examples

standard input	standard output
10 10 2 5 5 6 1 4 6 8 2 6 3 6 1 10 8 9 2 3 5 8	4 10 5 6 3 6 -1 6 8 8 -1 9 -1 -1
14 8 1 2 2 7 3 4 6 3 5 7 3 8 6 8 11 12	2 7 4 8 -1 7 3 8 -1 -1 -1 -1 12 -1 -1 -1

10 7 6 1 1 4 4 2 2 8 2 5 4 7 5 3	4 8 5 -1 2 7 3 1 -1 -1 -1 -1
5 5 1 2 3 2 5 3 5 4 2 3	2 3 2 -1 3 4

Problem B. The Poisoned Knife Problem

Input file: standard input
Output file: standard output
Time limit: 1 second
Memory limit: 256 megabytes

You and your friend have been doing the DSA Assignment this entire week, therefore, in order to take a break, you decide to play a game on the Happy Weekend.

The game is called The Poisoned Knife. In the game, your friend's character (Let's suppose X) has health of h units, your sole purpose in the game is to kill his character.

You can only attack X with a poisoned knife.

You are given an array, A where A_i denotes the time at which you are going to make a poisoned attack with the knife. For e.g., if A = [3,4,8], then you are going to make the knife attack at time = 3,4 and 8.

Note : Time array can be given in random order(not necessarily sorted).

When X is stabbed by the poisoned knife, a poison effect occurs on X, dealing 1 damage over the next k seconds (starting with the second after X was stabbed). However, if X is already poisoned, the knife will cancel the previous poison effect and apply a new one.

For example:

If k = 2, and A = [3,4,8], then,

At t = 1, damage = 0

At t = 2, damage = 0

At t = 3, damage = 1

At t = 4, damage = 1

At t = 5, damage = 1

At t = 6, damage = 0

At t = 7, damage = 0

At t = 8, damage = 1

At t = 9, damage = 1

At t >= 10, damage = 0

Therefore, total damage dealt to X = 5

Now, you have to find the minimum value of k such that the total damage dealt to X is greater than or equal to h.

Input

The first line contains a single integer q ($1 \le q \le 1000$) — the number of test cases. The first line of the test case contains two integers n and h ($1 \le n \le 100$; $1 \le h \le 10^{18}$) — the number of attacks and the amount of damage that needs to be dealt. The second line contains n integers $a_1, a_2, ..., a_n$ ($1 \le a_i \le 10^9$), where $a_i$is the second when the i-th attack is performed.

Output

For each test case, print a single integer — the minimum value of k such that the total damage dealt to X is greater than or equal to h.

Examples

standard input	standard output
3 1 294 77 3 10 2 4 10 5 3 1 11 21 31 41	294 4 1
1 4 99 21 19 2 5	80
1 2 100 7 3	96
2 2 20 22 21 2 40 4 21	19 23

5 3 100 22 31 26 3 100 45 68 17 3 100 79 19 48 3 100 57 89 41 3 100 1 49 50	91 49 40 52 51
1 5 45 14 11 10 17 12	38

Problem C. Smooth, Smoother, Smoothest

Input file: standard input
Output file: standard output
Time limit: 1 second
Memory limit: 256 megabytes

It is a universally accepted fact that the smoother the better.

You are given an array A of size N. You can perform the following operations on the array:

Choose an i ($1 \le i \le N$) and set $A_i = x$ ($1 \le x \le 10^9$).

Find the minimum number of operations needed to make the array A *k-smooth*.

Let's first define a *k-beautiful* array. An array A is *k-beautiful* if all its elements are equal to k. For example, [3, 3, 3, 3] is *3-beautiful*.

Let $|A|$ denote the size of the array A. An array A is called *k-smooth* if at least one of the following condition holds:

- $|A| > 1$, first half of A is *k-beautiful* and the second half of A is *(k+1)-smooth*
- $|A| > 1$, second half of A is *k-beautiful* and the first half of A is *(k+1)-smooth*
- $|A| = 1$, and A is *k-beautiful*

The first half of an array A is the subarray $A_1, A_2, ..., A_{(n+1)/2}$. The second half of an array A is the subarray $A_{((n+1)/2)+1}, A_{((n+1)/2)+2}, ..., A_n$. (Here n is the size of the array.)

For example, for the array [3, 6, 3, 4, 3], [3, 6, 3] is the first half, and [4, 3] is the second half.

Input

The first line contains two integers, N and k. The next line contains $A_1, A_2, ..., A_N$

$1 \le N \le 10^5$

$1 \le k \le 10^5$

$1 \le A_i \le 10^9$ for all ($1 \le i \le N$)

Output

Print the minimum number of operations needed to make the array *A*

k-smooth. Examples

standard input	standard output
5 4 5 5 6 4 4	0
8 1 3 5 1 1 1 1 2 2	4

Note

In the first test case, the array *A* is already *4-smooth*.

In the second test case, we convert the array to [1, 1, 1, 1, 3, 4, 2, 2]. This takes 4 operations and the array is now *1-smooth*. The first half [1, 1, 1, 1] is *1-beautiful* and the second half [3, 4, 2, 2] is *2-smooth*. Then the second half of this [2, 2] is *2-beautiful* and [3, 4] is *3-smooth*. Finally, [3] is *3-beautiful* and [4] is *4-smooth*.