MAX MEX MEX

Input file:	`standard input`
Output file:	`standard output`
Time limit:	3.5 seconds
Memory limit:	256 megabytes

The hamster Ilnur gifted Alice k baskets with numbers. Each basket has a number c_i written on it.

Alice can perform the following action several times (possibly zero):

1. Choose i such that $c_i > 0$.
2. Choose exactly one number from the i-th basket.
3. Increase the chosen number from the i-th basket by 1, and decrease the number c_i by 1.

This means that in the i-th basket, this action can be performed no more than c_i times.

Alice likes the sequence $0, 1, 2, \ldots$. For each basket, she can calculate the smallest missing element needed to continue such a sequence.

More specifically, Alice can find $MEX^\dagger$ in each basket.

Alice became curious—what is the maximum value of MEX of all MEX that can be obtained by performing several (possibly zero) of the above actions?

Note the constraint on k and $\sum n_i$ in the last subgroup.

$^\dagger MEX$ (minimum excluded) of an array is the smallest non-negative integer that does not belong to the array.

For example:

MEX of the array $[2, 2, 1]$ is 0, since 0 does not belong to the array.

MEX of the array $[3, 1, 0, 1]$ is 2, since 0 and 1 belong to the array, but 2 does not.

MEX of the array $[0, 3, 1, 2]$ is 4, since 0, 1, 2, and 3 belong to the array, but 4 does not.

Input

The first line of input contains three numbers—k ($1 \le k \le 10^5$), s ($1 \le s \le 10^6$), t ($1 \le t \le 2$).

The following $2 \cdot k$ lines contain the description of the baskets with numbers.

The description of each basket depends on the value of t and looks as follows:

For $t = 1$:

The first line contains two numbers—n_i ($0 \le n_i \le s, \sum n_i = s$, i.e., the sum $n_i = s$), c_i ($0 \le c_i \le 10^{12}$).

The second line contains n_i numbers a_{i_j} ($-10^6 \le a_{i_j} \le 10^6$)—the contents of the i-th basket.

For $t = 2$:

The first line contains two numbers—n_i ($0 \le n_i \le s, \sum n_i = s$), c_i ($0 \le c_i \le 10^{12}$).

The second line contains $2 \cdot n_i$ numbers—n_i pairs of numbers a_{i_j} ($-10^6 \le a_{i_j} \le 10^6$) b_{i_j} ($1 \le b_{i_j} \le 10^6$)—the contents of the i-th basket.

Here, b_{i_j} indicates that the number a_{i_j} is repeated b_{i_j} times.

Note that if $n_i = 0$, the next line will be empty.

Output

Output a single number—$MAX(MEX(MEX))$ of all baskets with numbers after performing the necessary actions.

Scoring

The tests for this problem consist of nine groups. Points for each group are awarded only if all tests of the group and all tests of some of the previous groups are passed.

Subtask	Points	Additional Constraints	Required Groups	Comment
0	0	–	–	Tests from the statement.
1	10	$t = 1, n_i \leq 15, k \leq 1000$	–	–
2	10	$t = 1, c_i = 0$	–	–
3	15	$t = 1, a_{i_j}$ are distinct in one basket	–	–
4	35	$t = 1$	1–3	–
5	30	$t = 2, k \leq 1000, s \leq 3 \cdot 10^4$	–	–

Examples

standard input	standard output
4 5 2 1 5 -4 1 1 0 -1000000 1000000000 1 3 0 3 2 100 10 3 -4 2	4
4 8 1 1 5 -4 0 10 3 3 0 0 0 4 1000000000000 100 -1000000 -1 957	4

Note

In the first set of input data, Alice can perform the following actions:

Basket 1 $[-4] \Rightarrow [-3] \Rightarrow [-2] \Rightarrow [-1] \Rightarrow [0]$.

Basket 2 is empty $[]$.

Basket 3 $[0, 0, 0] \Rightarrow [0, 0, 1] \Rightarrow [0, 1, 1] \Rightarrow [0, 1, 2]$

Basket 4 $[100, -1000000, -1, 957] \Rightarrow \ldots \Rightarrow [100, 0, 1, 957]$

Then $MEX_1 = 1, MEX_2 = 0, MEX_3 = 3, MEX_4 = 2$.

Thus, $MEX([MEX_1, MEX_2, MEX_3, MEX_4]) = MEX([1, 0, 3, 2]) = 4$.

In the second set of input data, Alice can perform the following actions:

Basket 1 $[-4] \Rightarrow [-3] \Rightarrow [-2] \Rightarrow [-1] \Rightarrow [0]$.

Basket 2 $[-1000000, -1000000, \ldots, -1000000]$ will remain unchanged.

Basket 3 $[0, 0, 0] \Rightarrow [0, 0, 1] \Rightarrow [0, 1, 1] \Rightarrow [0, 1, 2]$

Basket 4 $[10, 10, 10, -4, -4] \Rightarrow \ldots \Rightarrow [10, 10, 10, 0, 1]$

Then $MEX_1 = 1, MEX_2 = 0, MEX_3 = 3, MEX_4 = 2$.

Thus, $MEX([MEX_1, MEX_2, MEX_3, MEX_4]) = MEX([1, 0, 3, 2]) = 4$.