IOI '15 P3 - Teams

Time limit: 1.4s **Memory limit:** 512M

There is a class of N students, numbered 0 through $N-1$. Every day the teacher of the class has some projects for the students. Each project has to be completed by a team of students within the same day. The projects may have various difficulty. For each project, the teacher knows the exact size of a team that should work on it.

Different students may prefer different team sizes. More precisely, student i can only be assigned to a team of size between $A[i]$ and $B[i]$ inclusive. On each day, a student may be assigned to at most one team. Some students might not be assigned to any teams. Each team will work on a single project.

The teacher has already chosen the projects for each of the next Q days. For each of these days, determine whether it is possible to assign students to teams so that there is one team working on each project.

Example

Suppose there are $N = 4$ students and $Q = 2$ days. The students' constraints on team sizes are given in the table below:

Student	0	1	2	3
A	1	2	2	2
B	2	3	3	4

On the first day there are $M = 2$ projects. The required team sizes are $K[0] = 1$ and $K[1] = 3$. These two teams can be formed by assigning student 0 to a team of size 1 and the remaining three students to a team of size 3.

On the second day there are projects $M = 2$ again, but this time the required team sizes are $K[0] = 1$ and $K[1] = 1$. In this case it is not possible to form the teams, as there is only one student who can be in a team of size 1.

Task

You are given the description of all students: N, A, and B, as well as a sequence of Q questions — one about each day. Each question consists of the number M of projects on that day and a sequence K of length M containing the required team sizes. For each question, your program must return whether it is possible to form all the teams.

You need to implement functions:

```
void init(int N, int A[], int B[])
```

- The grader will call this function first and exactly once.
- `N`: the number of students.
- `A`: an array of length N: `A[i]` is the minimum team size for student i.

- `B`: an array of length N: `B[i]` is the maximum team size for student i.
- You may assume that $1 \leq A[i] \leq B[i] \leq N$ for each $i = 0, \ldots, N-1$.

```
int can(int M, int K[])
```

- After calling init once, the grader will call this function Q times in a row, once for each day.
- `M`: the number of projects for this day.
- `K`: an array of length M containing the required team size for each of these projects.
- The function should return `1` if it is possible to form all the required teams and `0` otherwise.
- You may assume that $1 \leq M \leq N$, and that for each $i = 0, \ldots, M-1$ we have $1 \leq K[i] \leq N$. Note that the sum of all $K[i]$ may exceed N.

Subtasks

Let us denote by S the sum of values of M in all calls to `can(M, K)`.

subtask	points	N	Q	Additional Constraints
1	21	$1 \leq N \leq 100$	$1 \leq Q \leq 100$	none
2	13	$1 \leq N \leq 100\,000$	$Q = 1$	none
3	43	$1 \leq N \leq 100\,000$	$1 \leq Q \leq 100\,000$	$S \leq 100\,000$
4	23	$1 \leq N \leq 500\,000$	$1 \leq Q \leq 200\,000$	$S \leq 200\,000$