

Task Name

Smallest Covering Segment 1

Difficulty

Hard

Problem Description

For each query point, report the length of the smallest interval that contains it, or -1 if none exists.

Problem Statement

You are given n closed intervals and q query points.

For each query point x , find the length of the smallest interval $[l, r]$ such that $l \leq x \leq r$. The length of an interval $[l, r]$ is defined as $r - l + 1$.

If no interval contains x , the answer for that query is -1.

Print the answers for all queries in the original query order.

Input Format

- The first line contains two integers n and q .
- Each of the next n lines contains two integers l and r .
- The last line contains q integers representing the query points.

Constraints

- $1 \leq n \leq 10^5$
- $1 \leq q \leq 10^5$
- $1 \leq l \leq r \leq 10^7$
- $1 \leq \text{query} \leq 10^7$

Output Format

Print q space-separated integers, where the i -th number is the answer for the i -th query.

Example 1

Input

```
4 4 1 4 2 4 3 6 4 4 2 3 4 5
```

Output

3 3 1 4

Explanation

- Query 2 is best covered by [2,4], length 3
- Query 3 is also best covered by [2,4], length 3
- Query 4 is best covered by [4,4], length 1
- Query 5 is best covered by [3,6], length 4

Example 2

Input

4 4 2 3 2 5 1 8 20 25 2 19 5 22

Output

2 -1 4 6

Tags

Sorting, Heap, Offline Queries, Intervals

Reference Solution Idea

Sort intervals by left endpoint and sort queries while remembering their original positions. As queries increase: - add every interval whose left endpoint is now reachable to a min-heap - remove intervals whose right endpoint is already too small - the top of the heap is the smallest valid interval for the current query

Store answers back in original query order.

Complexity

- Time: $O((n + q) \log n)$
- Space: $O(n + q)$

Suggested testcase roles

- input00/output00 -> Sample, strength 0
- input01/output01 -> Sample, strength 0
- input02/output02 -> Hidden, strength 34
- input03/output03 -> Hidden, strength 33
- input04/output04 -> Hidden, strength 33