Line Sweep Algorithm Concepts & Qns

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Motivation :

Every expert was once a beginner

who refused to quit.

Keep pushing & please never lose hope.

You've got this.

1854. Maximum Population Year → DAT / Line sweep

Easy | Topics | Companies | Hint

You are given a 2D integer array `logs` where each `logs[i] = [birth_i, death_i]` indicates the birth and death years of the `i^th` person.

The **population** of some year `x` is the number of people alive during that year. The `i^th` person is counted in year `x`'s population if `x` is in the **inclusive** range `[birth_i, death_i - 1]`. Note that the person is **not** counted in the year that they die.

Return *the **earliest** year with the **maximum population***.

Population

A → 1993 to 1998 → 1

B → 2000 to 2009 → 1

Example 1:

A B

```
Input: logs = [[1993,1999],[2000,2010]]
Output: 1993
Explanation: The maximum population is 1, and 1993 is the earliest year
with this population.
```

1950 to 1960 → 1

1960 to 1971 → 2

Example 2:

A B C

```
Input: logs = [[1950,1961],[1960,1971],[1970,1981]]
Output: 1960
Explanation:
The maximum population is 2, and it had happened in years 1960 and 1970.
The earlier year between them is 1960.
```

1970 to 1981 = 1

Constraints Analysis

1 <= logs.length <= 100

$1 <= \ldots$

$\because \quad 1950 <= birth_i < death_i <= 2050$

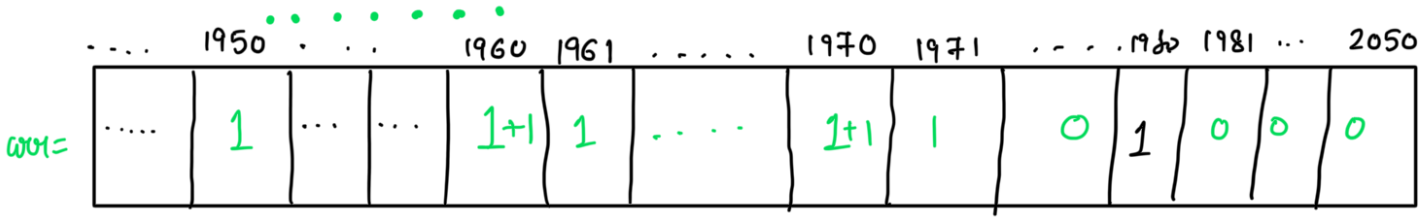
Thought Process

Brute Force

logs = [[1950, 1961], [1960, 1971], [1970, 1981]]

n n n

T.C = (Q * n)



maxPop = 2 → 1960

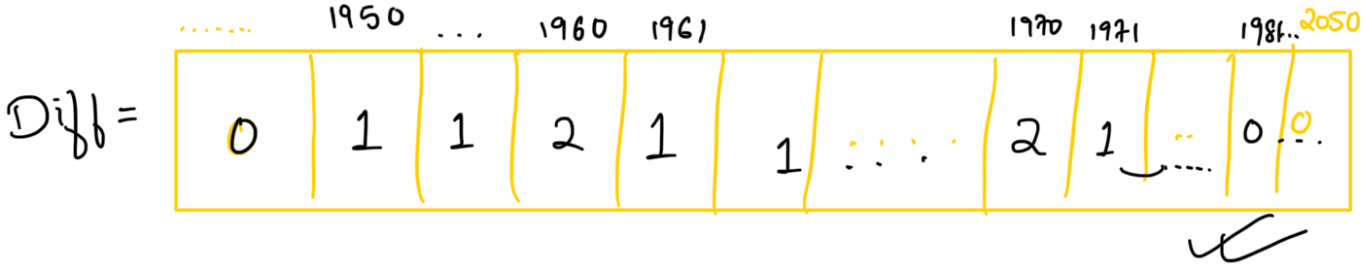
⇒ DAT / Line Sweep → Interval (Range)

DAY ...

logs = [[1950, 1961] , [1960, 1971] , [1970, 1981]]

0 -1 +1 1 -1 +1 2 -1

O(Q)



Step-2 (Cumulative Sum)

max = 2
year = 1960

O(N)

O(Q + N)

Line Sweep

logs = [[1950, 1961], [1960, 1971], [1970, 1981]]

events = {(1950, +1), (1961, -1), (1960, +1), (1971, -1), (1970, +1), (1981, -1)} n

Sort (events) ⇒

{(1950, +1), (1960, +1), (1961, -1), (1970, +1), (1971, -1), (1981, -1)}

O(n log n)

S.C = O(n)

currPop = 0

maxPop = 2

year = 1960