C - Flapping Takahashi

Editorial (/contests/abc434/tasks/abc434_c/editorial)

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Time Limit: 2 sec / Memory Limit: 1024 MiB

Score : 300 points

Problem Statement

Takahashi has decided to fly in the sky with balloons. Takahashi is at altitude H at time 0 (the unit is seconds), and will fly for 10^9 seconds from now.

Takahashi can change his flying altitude by up to 1 per second. However, he cannot make his altitude 0 or less.

- In other words, if $F(t)$ denotes Takahashi's altitude at time t, then $F(t)$ satisfies all of the following conditions:
  - $F(0) = H$
  - $-1 \leq \dfrac{F(u) - F(t)}{u - t} \leq 1$ for $0 \leq t < u \leq 10^9$.
  - $F(t) > 0$ for $0 \leq t \leq 10^9$.

There are N goals regarding altitude. The i-th goal is to make the altitude at time t_i at least l_i and at most u_i.
Is it possible for Takahashi to fly in a way that achieves all goals?

You are given T test cases; solve each of them.

Constraints

- $1 \leq T \leq 10^5$

- $1 \leq N \leq 10^5$
- $1 \leq H \leq 10^9$
- $1 \leq t_1 < t_2 < \cdots < t_N \leq 10^9$
- $1 \leq l_i \leq u_i \leq 10^9$
- The sum of N over all test cases is at most 10^5.
- All input values are integers.

Input

The input is given from Standard Input in the following format, where case_i denotes the i-th test case.

$$
\begin{aligned}
&T \\
&\mathrm{case}_1 \\
&\mathrm{case}_2 \\
&\vdots \\
&\mathrm{case}_T
\end{aligned}
$$

Each test case is given in the following format:

$$
\begin{aligned}
&N \quad H \\
&t_1 \quad l_1 \quad u_1 \\
&t_2 \quad l_2 \quad u_2 \\
&\vdots \\
&t_N \quad l_N \quad u_N
\end{aligned}
$$

Output

Output T lines. The i-th line should contain `Yes` if it is possible to fly in a way that achieves all goals in the i-th test case, and `No` otherwise.

Sample Input 1 Copy

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```
3
2 5
3 1 4
8 9 11
2 6
1 1 4
3 5 8
10 36
27 37 38
30 34 54
38 20 77
45 1 36
49 38 51
52 31 58
65 43 60
71 14 42
73 36 38
85 14 29
```

Sample Output 1 Copy

```
Yes
No
Yes
```

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For the first test case, Takahashi can achieve all goals by flying as follows:

- At time 0, he is at altitude 5.
- From time 0 to time 2, he descends at a rate of 0.5 per second.
- At time 2, he is at altitude $5 - 0.5 \times 2 = 4$.
- From time 2 to time 3, he stays at the same altitude.
- At time 3, he is at altitude 4. He satisfies the first goal.
- From time 3 to time 8, he ascends at a rate of 1 per second.
- At time 8, he is at altitude $4 + 1 \times 5 = 9$. He satisfies the second goal.

For the second test case, he cannot achieve all goals no matter how he flies.

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