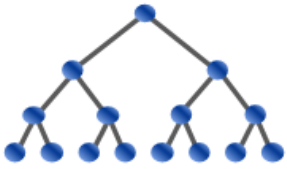
USA Computing Olympiad



USACO 2023 December Contest, Platinum
Problem 3. Train Scheduling

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Contest has ended.

Log in to allow submissions in analysis mode

English (en)

****Note: The memory limit for this problem is 512MB, twice the default.****

Bessie has taken on a new job as a train dispatcher! There are two train stations: A and B. Due to budget constraints, there is only a single track connecting the stations. If a train departs a station at time t, then it will arrive at the other station at time $t+T$ ($1 \leq T \leq 10^{12}$).

There are N ($1 \leq N \leq 5000$) trains whose departure times need to be scheduled. The ith train must leave station s_i at time t_i or later ($s_i \in \{A, B\}, 0 \leq t_i \leq 10^{12}$). It is not permitted to have trains going in opposite directions along the track at the same time (since they would crash). However, it is permitted to have many trains on the track going in the same direction at the same time (assume trains have negligible size).

Help Bessie schedule the departure times of all trains such that there are no crashes and the total delay is minimized. If train i is scheduled to leave at time $a_i \geq t_i$, the total delay is defined as $\sum_{i=1}^{N}(a_i - t_i)$.

INPUT FORMAT (input arrives from the terminal / stdin):

The first line contains N and T.

Then N lines follow, where the ith line contains the station s_i and time t_i corresponding to the ith train.

OUTPUT FORMAT (print output to the terminal / stdout):

The minimum possible total delay over all valid schedules.

SAMPLE INPUT:

```
1 95
B 63
```

SAMPLE OUTPUT:

```
0
```

The only train leaves on time.

SAMPLE INPUT:

```
4 1
B 3
B 2
A 1
A 3
```

SAMPLE OUTPUT:

```
1
```

There are two optimal schedules. One option is to have trains $2, 3, 4$ leave on time and train 1 leave after a one-minute delay. Another is to have trains $1, 2, 3$ leave on time and train 4 leave after a one-minute delay.

SAMPLE INPUT:

```
4 10
A 1
B 2
A 3
A 21
```

SAMPLE OUTPUT:

```
13
```

The optimal schedule is to have trains 1 and 3 leave on time, train 2 leave at time 13, and train 4 leave at time 23. The total delay is $0 + 11 + 0 + 2 = 13$.

SAMPLE INPUT:

```
8 125000000000
B 17108575619
B 57117098303
A 42515717584
B 26473500855
A 108514697534
B 110763448122
B 117731666682
A 29117227954
```

SAMPLE OUTPUT:

```
548047356974
```

SCORING:

- Inputs 5-6: $N \leq 15$
- Inputs 7-10: $N \leq 100$
- Inputs 11-14: $N \leq 500$
- Inputs 15-18: $N \leq 2000$
- Inputs 19-24: No additional constraints

Problem credits: Brandon Wang

Contest has ended. No further submissions allowed.