Clinic

by Matthew Ng Zhen Rui

You work at a clinic. The clinic factors-in the waiting time when selecting patients to treat next. This approach was adopted to prevent patients from having to wait too long before being treated. Your task is to help the clinic schedule treatments. There are three types of events, which will be queries for your system:

1. A patient arrives at the clinic at time. The patient has an arrival time T, a name M, and a condition of severity S.
2. A doctor becomes available to treat a patient at time T. The clinic must then assign the doctor to treat a patient with the highest priority. The priority is computed as $S + KW$, where S is the severity of the condition of the patient, W is the total time the patient has been waiting to be treated, and K is a service constant used by the clinic. If there are multiple patients with the same priority, the doctor is assigned to the patient with the lexicographically smallest name. Your program must then announce the name of that patient.
3. At time T, the clinic receives a notification that, due to unfortunate circumstances, a patient with name M has left the queue permanently. If no patient with name M exists in the queue, it is always a false alarm and will be ignored by the clinic. Otherwise, the notification is guaranteed to be valid and should be processed accordingly.

Input

The first line of the input contains two integers, $1 \leq N \leq 200000$ is number of events to be processed, and $0 \leq K \leq 10000000$, the constant for the clinic. N lines follow, each line beginning with an integer Q where Q is 1, 2 or 3. $Q = 1$ denotes a query of the first type and will be followed by an integer T, a string M, and an integer S. $Q = 2$ denotes a query of the second type and will be followed by an integer T. $Q = 3$ denotes a query of the third type and is followed by an integer T and a string M. For all queries, $0 \leq T, S, \leq 10000000$, and T values are strictly increasing. M is a non-empty alphanumeric string containing no spaces, and contains at most 10 characters. All patients have unique names. There is at least one query of the second type.

Output

For each query of the second type, output the name of the patient who will be treated on a new line. If the clinic is empty, print the string "doctor takes a break" (without quotes) on a new line instead.

Examples

Sample input 1

```
5 1
1 10 Alice 5
1 15 Bob 15
2 20
2 25
2 30
```

Sample output 1

```
Bob
Alice
doctor takes a break
```

Sample input 2

```
5 5
1 10 Alice 5
1 15 Bob 15
2 20
2 25
2 30
```

Sample output 2

```
Alice
Bob
doctor takes a break
```

Limits

Time limit is 3 seconds.

Memory limit is 1024 megabytes.