CCC JUNIOR LEC6

Topic: HashSet, HashMap/Table,

今日课程预览

- Review of last week’s last problem.
- Review of last week’s homework.
- HashSet
- HashMap
- Comparison between ArrayList, LinkedList, HashSet, HashMap
- Past exams

HashSet

Methods: add(), contains(), isEmpty(), iterator(), remove(), size()
Complexity analysis of the above methods.

HashMap:

Methods: put(K, V), get(K), keySet(), isEmpty(), size(), containsKey(), etc.
Complexity analysis of the above methods.

Problem J4: Wait Time

Problem Description
You exchange text messages with your friends. Since you receive so many messages, you want to measure how long your friends have to wait for your replies.

Your message device records each received and sent message in order using the following two kinds of entries:

- `R X` indicates a message was received from a friend numbered X;
- `S X` indicates a message was sent to a friend numbered X.

Your message device sends and receives messages instantaneously, and for each consecutive pair of entries described above, either

- a single entry `W X` is recorded in between them indicating they occur X seconds apart, or
- there is no entry between them and they occur one second apart.

Several rules of message etiquette are always followed:

- the only messages you send are replies to messages that you have received;
- you send at most one reply to any message from any particular friend;
- your friends do not send a subsequent message until you have replied to their previous message.

The wait time for a message is the time that passes between when you receive it and the time you reply to it. If a friend X received a reply to each message they sent, the total wait time for friend X is the sum of all wait times for all messages from friend X. Otherwise, the total wait time for friend X is -1.

Your job is to determine the total wait time for each friend.

EXAMPLE

Input Specification
The input consists of the integer M ($1 \leq M \leq 20$), followed by M lines, where each line consists of one character (`W`, `R`, or `S`), followed by a space, followed by an integer X ($1 \leq X \leq 100$). These M lines are the entries described above (in order).

Output Specification
Output one line for each friend that sent a message in the form X T where X is a friend number and T is the total wait time for friend X. The lines are in increasing order of the friend numbers.

Sample Input 1

```
5
R 2
R 3
W 5
S 2
S 3
```

Output for Sample Input 1

```
2 6
3 6
```

Explanation of Output for Sample Input 1
Friend 2 sends a message at time 0 and Friend 3 sends a message at time 1. Friend 2 receives a reply at time 6 and Friend 3 receives a reply at time 7.

CONTINUE

Explanation of Output for Sample Input 1

Friend 2 sends a message at time 0 and Friend 3 sends a message at time 1. Friend 2 receives a reply at time 6 and Friend 3 receives a reply at time 7.

Sample Input 2

```
14
R 12
W 2
R 23
W 3
R 45
S 45
R 45
S 23
R 23
W 2
S 23
R 34
S 12
S 34
```

Output for Sample Input 2

```
12 13
23 8
34 2
45 -1
```

Explanation of Output for Sample Input 2

For Friend 12, a message is received at time 0 and replied to at time 13. For Friend 23, two messages are exchanged, with the first message having a wait time of 6 seconds and the second message having a wait time of 2 seconds. For Friend 34, a message is received at time 10 and replied to at time 12. Friend 45 sends a message which is never replied to.

CONTINUE

Comparisons:

Methods complexities between ArrayList, LinkedList, HashMap, HashSet.

Problem J4: Arrival Time

Problem Description
Fiona commutes to work each day. If there is no rush-hour traffic, her commute time is 2 hours. However, there is often rush-hour traffic. Specifically, rush-hour traffic occurs from 07:00 (7am) until 10:00 (10am) in the morning and 15:00 (3pm) until 19:00 (7pm) in the afternoon. During rush-hour traffic, her speed is reduced by half.

She leaves either on the hour (at XX:00), 20 minutes past the hour (at XX:20), or 40 minutes past the hour (at XX:40).

Given Fiona's departure time, at what time does she arrive at work?

Input Specification
The input will be one line, which contains an expression of the form `HH:MM`, where `HH` is one of the 24 starting hours (00, 01, . . ., 23) and `MM` is one of the three possible departure minute times (00, 20, 40).

Output Specification
Output the time of Fiona's arrival, in the form `HH:MM`.

Sample Input 1
```
05:00
```

Output for Sample Input 1
```
07:00
```

Explanation for Output for Sample Input 1
Fiona does not encounter any rush-hour traffic, and leaving at 5am, she arrives at exactly 7am.

Sample Input 2
```
07:00
```

Output for Sample Input 2
```
10:30
```

Explanation for Output for Sample Input 2
Fiona drives for 3 hours in rush-hour traffic, but only travels as far as she normally would after driving for 1.5 hours. During the final 30 minutes (0.5 hours) she is driving in non-rush-hour traffic.

Sample Input 3
```
23:20
```

PAST EXAMS:

Output for Sample Input 3

```
01:20
```

Explanation for Output for Sample Input 3

Fiona leaves at 11:20pm, and with non-rush-hour traffic, it takes two hours to travel, so she arrives at 1:20am the next day.

PAST EXAMS:

Problem J4/S2: Sunflowers

Problem Description
Barbara plants N different sunflowers, each with a unique height, ordered from smallest to largest, and records their heights for N consecutive days. Each day, all of her flowers grow taller than they were the day before.

She records each of these measurements in a table, with one row for each plant, with the first row recording the shortest sunflower's growth and the last row recording the tallest sunflower's growth. The leftmost column is the first measurement for each sunflower, and the rightmost column is the last measurement for each sunflower.

If a sunflower was smaller than another when initially planted, it remains smaller for every measurement.

Unfortunately, her children may have altered her measurements by rotating her table by a multiple of 90 degrees.

Your job is to help Barbara determine her original data.

Input Specification
The first line of input contains the number N ($2 \leq N \leq 100$). The next N lines each contain N positive integers, each of which is at most 10^9. It is guaranteed that the input grid represents a rotated version of Barbara's grid.

Output Specification
Output Barbara's original data, consisting of N lines, each of which contain N positive integers.

Sample Input 1
```
2
1 3
2 9
```

Output for Sample Input 1
```
1 3
2 9
```

Explanation of Output for Sample Input 1
The data has been rotated a multiple of 360 degrees, meaning that the input arrangement is the original arrangement.

PAST EXAMS:

Sample Input 2

```
3
4 3 1
6 5 2
9 7 3
```

Output for Sample Input 2

```
1 2 3
3 5 7
4 6 9
```

Explanation of Output for Sample Input 2

The original data was rotated 90 degrees to the right/clockwise.

Sample Input 3

```
3
3 7 9
2 5 6
1 3 4
```

Output for Sample Input 3

```
1 2 3
3 5 7
4 6 9
```

Explanation of Output for Sample Input 3

The original data was rotated 90 degrees to the left/counter-clockwise.

PAST EXAMS: