Problem 246: Air Terminator Control

Difficulty: Hard

Author: Matt Hussey, Ampthill, Reddings Wood, United Kingdom

Originally Published: Code Quest 2024

Problem Background

You're working with Lockheed Martin Missiles & Fire Control and the Royal Air Force to develop an artificial intelligence system to monitor protected airspace around the British Isles. While eventually the system will be able to make judgements about encroaching aircraft on its own, it needs to be trained to know what to look for first. For now, your team is going to write an algorithm that uses a checklist system to determine the threat level of an aircraft. The system will eventually compare these assessments with those made by security analysts to determine how to make assessments of its own.

Problem Description

The AI system and your algorithm will be provided with tracking information for a series of aircraft that have been observed flying in and around protected airspace. Every 15 minutes, the radar system reports the aircraft that are currently within that protected airspace. Your data will consist of the times at which each aircraft was observed. Gaps in these times – for example, if an aircraft was observed at 01:00 and again at 01:30, but not at 01:15 – indicate that the aircraft left, then re-entered protected airspace.

Using this information, you must determine the threat level associated with that aircraft (NONE, LOW, MEDIUM, or HIGH) using the following criteria:

- If the aircraft's transponder identifies it as a friendly aircraft, it poses no threat (NONE). Otherwise, the aircraft has a minimum threat level of NONE, but that may be increased by other conditions in this list.
- The total number of data points within protected airspace affects the minimum threat level:
  - At least 12 data points: LOW
  - At least 24 data points: MEDIUM
  - At least 36 data points: HIGH
- The length of the longest continuous series of data points within protected airspace affects the minimum threat level:
  - At least 4 continuous data points: LOW
  - At least 8 continuous data points: MEDIUM
  - At least 12 continuous data points: HIGH
- The number of times the aircraft entered protected airspace affects the minimum threat level:
  - Entered on at least 4 separate occasions: MEDIUM

- Entered on at least 8 separate occasions: HIGH

Sample Input

The first line of your program's input, received from the standard input channel, will contain a positive integer representing the number of test cases. Each test case will include:

- A line containing the following values, separated by a space:
  - A Boolean value indicating if the aircraft is (TRUE), or is not (FALSE), identified as friendly
  - A positive integer, N, representing the number of data points recorded for the aircraft
- N lines, each containing a time in 24-hour HH:MM format, representing the times at which the aircraft was observed within protected airspace. Times are given in chronological order and have a minimum interval of 15 minutes.

Due to the length of the sample input, it is presented on the next page to avoid breaking across pages.

```
4
TRUE 6
12:00
12:15
12:30
12:45
13:00
13:15
FALSE 6
12:00
12:15
12:30
12:45
13:00
13:15
FALSE 14
09:15
09:30
09:45
11:00
11:15
11:30
11:45
12:00
12:15
12:30
12:45
15:30
15:45
16:00
FALSE 9
07:15
07:45
08:30
09:00
11:00
12:15
13:45
14:30
15:00
```

Sample Output

For each test case, your program must print a single line containing one of the words NONE, LOW, MEDIUM, or HIGH, representing the threat level presented by the aircraft.

```
NONE
LOW
MEDIUM
HIGH
```