Time Dilated Work Peak

You have 60 minutes to solve this problem. We recommend starting off with a simple *naïve* solution, and try to make improvements from there.

Use a programming language of your choice. Expect to be asked to present your code and explain your solution method. Your delivery is evaluated with the following priorities:

- Ability to output a solution
- Optimality of output solution
- Runtime of solution method

Problem statement

Time dilation occurs as a consequence of massive objects creating a gravitational field that *literally* slows down time. You are the data analyst working in a team that does analysis of work schedules, when a supermassive black hole approaches Earth, and changes the amount of hours in a day from 24, to a constant r (in theory, you wouldn't actually experience this, but a distant observer would). Thus, you have had to get used to a day having r hours instead of 24. This has given rise to strange working hours, like working from 38:00 - 42:00. However, this does not bother you, so you continue with your daily tasks.

You are asked to do an analysis that finds the maximum number of active workers at any given time over the course of a week.

As input you are given the constant r, a list of days with corresponding ids, and for each day, a list of shifts for the employees. If a day has an id x, then any other day with another id $y>x$ occurs after the day with id x.

The company only assigns shifts in hourly intervals, which means that a working shift "08:00-10:00" has a simple representation "8-10". The hour when a shift ends does not count against the number of active employees. If a shift ends before it starts, this means that it passes over midnight, and continues on the next day. A shift cannot last more than r hours. In case the start hour is equal to the end hour, the shift should not be counted.

Return the day, hour, and the maximum count of employees working at the same time. If more than one solution exists, you may return any of them.

Input:
r = total number of hours in a day
n= total number of shifts spread over days
24 <= r <= 99999
1 <= n <= 2^18

Run your solution method on instance 1 to 7. The first three instances are provided as examples below.

Example 1:
r = 26
Day 1: ["8-12", "8-12", "9-26", "25-26", "25-26"]
Day 2: ["0-1","1-2", "2-3", "4-5", "5-6", "6-7"]

Solution: Day 1 at hour 9 has 3 employees

Example 2:
r=103
Day 1: ["31-33", "38-99", "45-69", "48-103"]
Day 3: ["1-100", "75-100", "74-100", "37-100", "54- 101", "100-101", "100-102", "100-101", "100-102", "100-103"]

Solution: Day 3 at hour 100 has 6 employees

Example 3:
r = 24
Day 1: ["18-4","20-8", "20-8", "23-2", "23-21"]
Day 3: ["08-15", "08-23", "22-04", "22-04", "22-04", "23-05"]
Day 4: ["02-08", "01-08", "03-08", "01-08"]

Solution: Day 4 at hour 3 has 8 employees