Problem 10: Taxi Time
14 Point(s)

Problem ID: `taxi`
Rank: 3

Introduction

At your new startup Linear.ly, you have decided to disrupt the transportation industry with your revolutionary app idea—it gives users a rundown of the all cheapest ride options in their city! Lucky for you, most ride options follow a linear model: they first charge you a flat drop rate, and the fare increases at a constant rate from there. Your team has already given you the ability to access all transportation options in any city—it's up to you to finish the rest!

Problem Statement

Your task is to create a program that will output the name of the cheapest ride option in a given city for all possible integer distances given $\mathbf{N}$ taxis in the area with drop rates $\mathbf{B_1}$, $\mathbf{B_2}$, $\mathbf{\ldots}$, $\mathbf{B_N}$ and mileage rates $\mathbf{M_1}$, $\mathbf{M_2}$, $\mathbf{\ldots}$, $\mathbf{M_N}$. If multiple taxis share the same cheapest cost at a given distance, output the one with the lowest mileage rate.

Input Format

The first line of the input contains a positive integer $\mathbf{T}$ denoting the number of test cases that follow. For each test case:

- The first line consists of a city name and a positive integer $\mathbf{N}$ denoting the number of taxis that follow.
- The next $\mathbf{N}$ lines each consist of three space-separated values $\mathbf{s_i}$ $\mathbf{B_i}$ $\mathbf{M_i}$:
  - The string $\mathbf{s_i}$ denotes the name of taxi i
  - The non-negative integer $\mathbf{B_i}$ denotes the drop rate (flat starting fee) of taxi i in dollars.
  - The non-negative integer $\mathbf{M_i}$ denotes the mileage rate of taxi i in dollars per mile.
- The final line is blank to separate individual test cases.

Output Format

For each test case, your program should output the cheapest ride option in a given city for all possible distances in the following format:

```
<CITY NAME>:
<DISTANCE RANGE>: <NAME>
<DISTANCE RANGE>: <NAME>
<...>
<DISTANCE>+: <NAME>
```

- Each distance range should consist of non-negative integer mile distances for which a given ride option is the cheapest. The ranges may consist of the following:
  - A distance range consisting of two mile distances separated by a dash -, representing the minimum and maximum distances $\mathbf{X_1}$ $\mathbf{X_2}$ for which a given listing is the cheapest option.
  - A single distance value $\mathbf{X}$, for which a given listing is the cheapest option.
  - An open-ended distance range consisting of a single distance value $\mathbf{X}$ followed by a plus symbol +, representing all values above a minimum distance for which a given listing is the cheapest option.

Problem Constraints

$1 \le \mathbf{T} \le 10^3$

$1 \le \mathbf{N} \le 100$

$1 \le \mathbf{B_{1..N}}, \mathbf{M_{1..N}} \le 10^4$

$0 \le \mathbf{X_i} \le 10^6$ for all i

All names will be non-empty.

The length of all names will not exceed 100.

All names will only consist of lowercase letters, numbers, and underscores.

All ride options will have different names.

No two taxis will share the same drop rate and mileage rate.

Sample Test Cases

Sample Input:

```
4
rio_de_janeiro 3
yellow_cab 12 237
blue_transit 1626 84
smart_car 799 100

palo_alto 1
uber 510 137

berkeley 4
red_bus 0 1611
green_bus 0 1610
blue_bus 123 456
yellow_bus 2034 455

hangzhou 3
fly_taxicab 1134 211
premium_cab 753 211
blue_line 2649 0
```

Sample Output:

```
rio_de_janeiro:
0-5: yellow_cab
6-51: smart_car
52+: blue_transit

palo_alto:
0+: uber

berkeley:
0: green_bus
1-1910: blue_bus
1911+: yellow_bus

hangzhou:
0-8: premium_cab
9+: blue_line
```