Problem 216: Modem Mania

Difficulty: Medium

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Problem Background

Internet Service Providers (ISPs) are your gateway to the rest of the world. They provide the infrastructure and hardware necessary to allow your ever-growing list of internet connected devices the ability to actually connect to the internet. This internet connectivity is quickly becoming a crucial part of everyday life, a fact that's only been highlighted over the events of the past two years. As a result, many feel that ISPs should be treated as a utility service, like an electric company. If this happens, this may result in some changes in how ISPs operate their businesses.

Problem Description

Lockheed Martin has been contracted by Quickfire Internet Services to develop new hardware for their modems. Quickfire wants to change their billing model to charge users based on the number of devices they're using, rather than on the speed of their internet connection; they're planning to use the new modems to help with this process.

Internet traffic is managed using IP (Internet Protocol) addresses, which you've likely heard of. When you access the internet, your computer connects through your modem, which is assigned an IP address. This address is used by websites to send you data you've requested. However, IP addresses can be shared by multiple devices. Since your modem is actually what's connecting to the internet, it's what receives the IP address visible on the internet; behind the modem, on your local network, could be dozens of devices, all sharing that same connection. This also applies when companies like Lockheed Martin use proxy servers to manage traffic, or countries such as China or Qatar use firewalls to manage and censor internet access to their citizens.

Within these local networks, these devices are assigned internal IP addresses, but they are also identified by a unique MAC (Media Access Control) address. A MAC address is a series of twelve hexadecimal digits assigned by the device's manufacturer. You can think of an IP address as a mailing address used to ship someone a package; the MAC address is then the unique signature a person must give when receiving that package.

Quickfire wants their new modems to track the MAC addresses connected to them and transmit these addresses to their central billing server. Users will then be billed based on the number of unique MAC addresses connected to their modem. Each time a device attempts to access data on the internet, the modem will send a message to Quickfire listing the IP address of the modem and the MAC address of the device. They want your team to develop an algorithm to collate this data for billing purposes.

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 a single integer, X, representing the number of address pairings in the test case
- X lines, each containing an IPv4 address and a MAC address, separated by a space.
    - IPv4 addresses consist of four integers, between 0 and 255 inclusive, separated by periods (.).
    - MAC addresses consist of six pairs of hexadecimal digits, with each pair separated by a colon (:).

```
1
6
143.228.1.43 01:23:45:67:89:0A
192.197.82.189 BC:DE:F0:12:34:56
194.60.0.255 78:90:AB:CE:EF:01
192.197.82.189 23:45:67:89:0A:BC
143.228.1.43 DE:F0:12:34:56:78
143.228.1.43 90:AB:CD:EF:01:23
```

Sample Output

For each test case, your program must print one line for each unique IP address listed in the input, including:

- The IP address
- A space
- The number of unique MAC addresses listed for that IP address

IP addresses should be listed in ascending numeric order; if the first numbers within two IP addresses are equal, break ties with the second numbers, and so on.

```
143.228.1.43 3
192.197.82.189 2
194.60.0.255 1
```