Daily life of a router

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1.Topic:Trie
2.Description:

      Imagine you are a router, your job is to assign IPs to those devices that request for connection. You will be given a series of network masks which indicates the addresses that are valid for use.

      Network mask is given as A.B.C.D/S, where A, B, C, and D are integers ranging from 0 to 255, while S is an integer ranging from 1 to 32. A.B.C.D is an IPv4 address, masked by S,the length of its subnet mask.

      For example, if you are given 140.112.2.2/24 as your network mask, every IP whose binary starts with 10001100.01110000.00000010 can be assign to your client. Therefore, you can assign any IP from 140.112.2.0 to 140.112.2.255 to your client.It means that you have 256 ip addresses available for your client (Ignoring the fact that 140.112.2.0 and 140.112.2.255 are reserved network).

      Besides, each subnet mask will be given following by its lease time, which is the maximum time that an IP can be use for each connection. The stated lease time is counted by the number of actions. It will expire once it reaches zero and free to be lease again.

      Each IP can only be mapped to one device. For each of the request, you have to reply the user whether they could can get IP for connection or not.

3.Format:

Input Format:

The first line contains n, which is the number of actions for the cases.
For each of the following n lines, the first integer is m which indicates the number of actions to be executed.

      if m = 1, it will be followed by A.B.C.D/S (subnet mask) and t(lease time).
      if m = 2, it will be followed by A.B.C.D (ip address that the client request).

Output results correspond to the actions taken.

If the IP have already been used by another device:
HahahaXD You are too late

Assign the IP to the device that request for connection:
Your device has the ip address A.B.C.D
If the IP address is not available within your subnet mask:
Invalid

Output Format:

For each query, output a correspond result.

Input constraint:

It is guaranteed that

$1 \le n \le 10^6$
$0 \le A,B,C,D \le 255$
$1 \le S \le 32$
$1 \le t \le 10^6$

If the IP address requested match the results of more than one subnet mask, it will follow the
lease time of the subnet mask with wider range. (16 instead of 24)
Other than that, if two identical IP network mask were given, follow the lease time of the later
network mask.

4.Example:

Input

```
8
1 192.168.2.1/24 3
1 140.112.2.2/16 10
2 192.168.2.0
2 130.1.1.1
2 192.168.2.0
1 20.0.0.2/30 15
2 192.168.2.0
2 140.112.255.255
```

Output

```
Your device has the ip address 192.168.2.0
```

```
Invalid
HahahaXD You are too late
Your device has the ip address 192.168.2.0
Your device has the ip address 140.112.255.255
```

5.Time and memory limit:

Time: 5s.
Memory: 256MiB

Testdata set:
Subtask 1: n=10^2 20%
Subtask 2: n=10^4 20%
Subtask 3: n=10^6 20%
Subtask 4: n=10^6 20%
Subtask 5: n=10^6 20%

中文版本:

想像你是一台路由器。你會得到一些netmask來標示合法的IP範圍,並分配IP給發出請求的電腦使用一段時間。如果IP不在netmask的範圍內,或是已經被其他電腦使用,就要做出不同的回應,請完成身為路由器的使命。

首先說明netmask的設定,他的格式是A.B.C.D/S,ABCD都是0~255的整數,代表IP位置,S則是1~32的整數,代表子網路遮罩。判斷範圍時,把A.B.C.D轉換換成二進位,保留左邊算起的S位固定不變,其他位數可以是任意的1或0,便是這個netmask的範圍。

以192.168.2.2/24為例,把IP位置轉成二進位後,保留左邊算起的24位
(**11000000.10101000.00000010**)。則合法範圍就是**11000000.10101000.00000010.**00000000到
11000000.10101000.00000010.11111111,也就是192.168.2.0到192.168.2.255。

此外,Netmask後面是IP的有效時間,每一個動作為一單位的時間。當時間倒數至0,該IP會重新釋放出來,就可以再給其他電腦使用。

接著是電腦發出分配IP的請求。如果電腦要求的IP不在合法的範圍中,警告他"Invalid";如果電腦要求的IP正在被其他電腦使用,嘲笑他"HahahaXD You are too late";否則告訴他"Your device has the ip address [請求的IP]"。

身為一台好的路由器,請不要讓要求IP的電腦等太久。

More input and output:

Input:
```
100
2 92.52.208.210
1 133.63.243.255/28 23
1 172.175.169.34/32 59
1 1.240.77.93/22 24
1 149.40.57.105/16 54
2 38.145.95.153
2 9.125.228.15
1 206.110.106.62/22 3
2 86.210.199.122
2 30.84.81.20
2 158.172.61.134
2 16.125.118.102
2 125.42.112.247
1 0.12.23.27/32 23
2 114.185.229.178
2 39.60.158.175
2 122.206.246.111
2 200.100.206.177
1 233.246.251.73/15 55
1 89.49.53.24/31 35
2 164.115.16.100
2 142.68.93.160
1 156.223.166.17/11 2
2 160.72.177.129
1 113.185.123.114/21 49
2 0.234.40.246
2 179.54.77.197
2 107.122.62.33
1 216.4.83.82/25 6
1 24.239.56.190/21 26
2 200.100.206.177
1 51.147.133.207/32 2
2 9.125.228.15
2 101.153.43.40
2 179.54.77.197
1 235.89.101.147/10 61
2 252.44.210.210
2 1.110.39.238
2 249.203.92.96
```

```
1 79.12.45.162/11 4
2 113.49.41.103
2 224.44.225.148
2 100.24.245.30
2 100.24.245.30
1 166.88.232.158/23 1
2 239.139.54.88
1 163.147.102.55/32 17
2 24.4.214.86
2 100.24.245.30
2 43.52.74.210
1 157.107.141.7/1 5
2 249.203.92.96
2 141.169.159.230
1 96.85.8.160/26 3
1 45.39.20.134/6 9
2 200.100.206.177
2 192.109.130.182
2 137.54.78.176
2 100.24.245.30
2 249.203.92.96
1 217.160.7.155/30 63
2 39.125.99.120
1 133.144.243.142/22 31
1 117.248.133.97/29 65
1 253.111.168.213/28 1
2 113.191.195.102
1 243.39.97.220/26 32
2 179.54.77.197
2 218.151.33.168
2 217.221.240.157
1 45.98.53.85/15 18
1 172.198.224.12/22 10
2 0.234.40.246
1 118.18.96.20/27 31
2 9.125.228.15
2 43.52.74.210
2 39.125.99.120
2 118.162.182.178
2 243.127.119.77
2 1.110.39.238
1 139.208.77.60/12 3
2 8.42.253.78
```

```
1 119.62.4.173/17 29
1 39.167.170.61/32 37
2 199.178.152.75
2 92.185.120.17
2 45.252.149.185
2 45.252.149.185
2 113.202.51.241
2 140.235.125.250
2 178.62.165.43
2 45.252.149.185
2 141.59.179.213
2 43.52.74.210
2 39.125.99.120
2 186.133.203.48
2 154.235.202.176
2 100.24.245.30
2 39.125.99.120
2 44.205.62.102
```

Output:
```
Invalid
Invalid
Invalid
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```

```
Invalid
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Invalid
Invalid
Your device has the ip address 249.203.92.96
Your device has the ip address 141.169.159.230
Your device has the ip address 200.100.206.177
Your device has the ip address 192.109.130.182
Your device has the ip address 137.54.78.176
Invalid
Your device has the ip address 249.203.92.96
Invalid
Invalid
Your device has the ip address 179.54.77.197
Your device has the ip address 218.151.33.168
Your device has the ip address 217.221.240.157
Invalid
Invalid
Invalid
Invalid
Invalid
Your device has the ip address 243.127.119.77
Invalid
Invalid
Your device has the ip address 199.178.152.75
Invalid
Your device has the ip address 45.252.149.185
HahahaXD You are too late
Invalid
Your device has the ip address 140.235.125.250
Your device has the ip address 178.62.165.43
HahahaXD You are too late
Your device has the ip address 141.59.179.213
Invalid
Invalid
Your device has the ip address 186.133.203.48
Your device has the ip address 154.235.202.176
```

Invalid
Invalid
Your device has the ip address 44.205.62.102