2 Ambiguous Dates

Background

More than 200 companies in more than 50 countries all over the world contribute towards the success of the *Merck Group*. You can imagine that every day *Merck Group Headquarters* at Darmstadt gets loads of mail from all over the world, the layout of all the letters following the customary style of their origin. In particular, the representation of a date is often ambiguous if you do not know in what order day, month, and year are given.

For example, if you read `01-02-03`, you do not know if that represents the first of February 1903, or 2003, or if it is the third of February 1901, or 2001. It might even be the second of March 2001, or some other permutation of the three numbers. Instead of the hyphens, there could also be slashes, backslashes, dots, commas, or no delimiters at all.

Problem

You are hired to write a program that converts dates given in an unknown format to the format of the *Adjusted Calender of Merck (ACM)*. The latter specifies the number of days relative to November 4, 2001, an important day in *Merck*'s history.

Input

The first line contains the number of scenarios.

Every scenario contains a single date on a line by itself. A date consists of three parts: A day, a month, and a year given in any order, separated either by exactly two identical delimiters, or not separated by delimiters at all. Delimiters can be slashes "`/`", backslashes "`\`", hyphens "`-`", dots "`.`", or commas "`,`".

The day and month are represented by a single digit, or by two digits, the first of which can be a leading zero. Valid years are in the range $1700 \ldots 2299$; either all four digits are given, or just the last two that specify the year relative to the century. In the latter case, a leading zero may be omitted.

Dates are considered illegal if no valid interpretation exists. More precisely, a date is illegal if no classification of the digits as day, month, and year results in a valid date in the range January 1, 1700, to December 31, 2299. However, you can be sure that all dates given contain 3 to 8 digits, and no other characters except for maybe the two delimiters.

Remember that February 29 is a valid date for leap-years only. A year is a leap-year if and only if either its number is divisible by four, but not by one hundred, or if its number is divisible by four hundred. So, in particular, 2000 is a leap-year, while 1700, 1800, 1900, 2100, or 2200 are not.

Output

The output for every scenario begins with a line containing "`Scenario #i:`", where `i` is the number of the scenario starting at 1.

For every scenario, print all possible interpretations of the given date in the format of the *Adjusted Calender of Merck (ACM)*, each interpretation in a single line, in ascending order and with duplicates removed. If no valid interpretation exists, print a line containing `Illegal date` instead.

Terminate the output for each scenario with a single blank line.

Sample Input

```
3
1631/02/29
2001-11-03
010203
```

Sample Output

```
Scenario #1:
Illegal date

Scenario #2:
-238
-1

Scenario #3:
-109847
-109820
-109513
-109456
-109149
-109119
-73323
-73296
-72989
-72932
-72625
-72595
-36799
-36772
-36465
-36408
-36101
-36071
-274
-247
60
117
424
454
36250
36277
36584
36641
36948
36978
72774
72801
73108
73165
73472
73502
```

3 Cog-Wheels

Background

Your little sister has got a new mechanical building kit, which includes many cog-wheels of different sizes. She starts building gears with different ratios, but soon she notices that there are some ratios which are quite difficult to realize, and some others she cannot realize at all. She would like to have a computer program that tells her what ratios can be realized and what ratios cannot. She asks you to write a program that does the job.

For example, let us assume that the kit contains cog-wheels with 6, 12, and 30 cogs. Your sister wants to realize a gear of ratio $5 : 4$. One possible solution is shown in Figure 2.

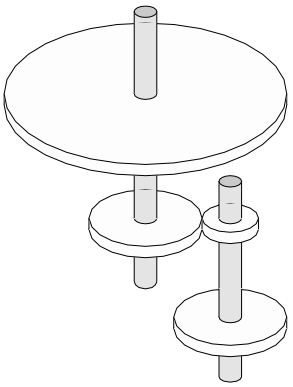


Figure 2: Combination of cog-wheels realizing a gear of $5 : 4$.

It depicts a complete gear of ratio $5 : 4$. Four wheels are used: cog-wheels of sizes 30 and 12 on the first axis, cog-wheels of sizes 6 and 12 on the second axis. The gear ratio is given by

$$\frac{30}{12} \cdot \frac{6}{12} = \frac{5}{2} \cdot \frac{1}{2} = \frac{5}{4} = 5 : 4,$$

as desired. However, a gear of ratio $1 : 6$ cannot be realized using the cog-wheels your sister has.

Problem

Given the sizes of the cog-wheels in the kit (i.e. the number of cogs they have), decide whether a given gear ratio can be built or not. You may use any finite number of cog-wheels of each size available.

Input

The input begins with a line containing the number of scenarios.

The input for each scenario starts with a description of the cog-wheels in the kit. First, there is a line containing the number n of different sizes of cog-wheels ($1 \leq n \leq 20$). The next line contains n numbers $c_1 \ldots c_n$, separated by single blanks. These denote the n different sizes of the cog-wheels in the kit, with $5 \leq c_i \leq 100$ for $i = 1, \ldots, n$. You may assume that there is a cog-wheel of smallest size $c = \min\{c_1, \ldots, c_n\}$ in the kit such that all sizes $c_1, \ldots, c_n$ are multiples of c.

The line describing the available cog-wheels is followed by the list of gear ratios to be realized. It starts with a line containing the number m of ratios. The next m lines each contain two integers a and b, separated by a single blank. They denote the ratio $a : b$, with $1 \leq a, b \leq 10000$.

Output

The output for every scenario begins with a line containing "`Scenario #i:`", where `i` is the number of the scenario starting at 1. Then print the results for all the gear ratios given in that scenario. For each gear ratio $a : b$, print a line containing either

```
Gear ratio a:b can be realized.
```

or

```
Gear ratio a:b cannot be realized.
```

Terminate the output of each scenario with a blank line.

Sample Input

```
2
3
6 12 30
2
5 4
1 6
1
42
2
13 13
42 1
```

Sample Output

```
Scenario #1:
Gear ratio 5:4 can be realized.
Gear ratio 1:6 cannot be realized.

Scenario #2:
Gear ratio 13:13 can be realized.
Gear ratio 42:1 cannot be realized.
```