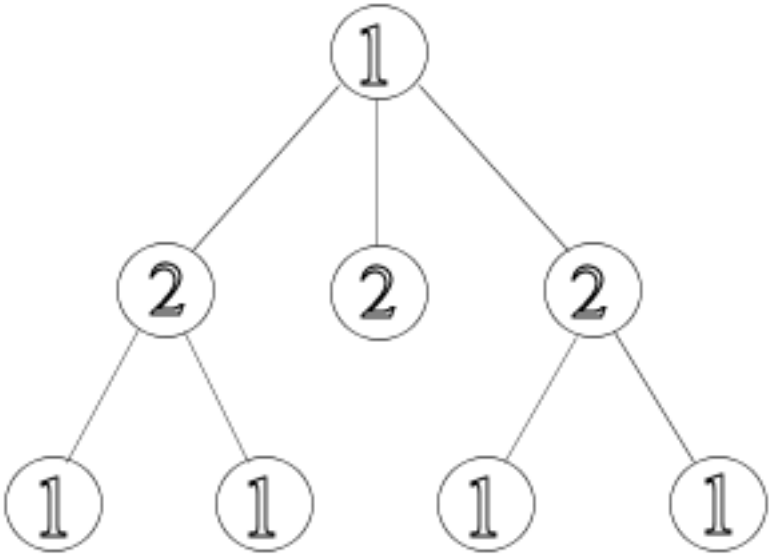
Problem A

ALTERNATIVE ARBORECSENCE

Given a graph, we define "proper coloring" as coloring of the graph nodes in such way that no two adjacent nodes have the same color. If we map each color to a positive integer, we can calculate the sum of all colors assigned to the graph.

In this problem you will be given a tree (connected graph with no simple loops). Can you determine what the minimum color sum can be achieved when the tree is properly colored? (Image to the right shows a proper coloring of the second example tree with sum=11)



Input

The input file consists of several test cases. Each test case starts with n ($1 \le n \le 10000$), the number of nodes in the tree. Next n lines will be of the form "*u: v1 v2 ... vk"* where u is the root of a subtree and vi's are its children ($0 \le u, vi \le n$-1).

Every test case will be followed by a blank line. Input ends with a case n=0, which should not be processed.

Output

For each test case print the minimum sum of colors that can be achieved by some proper coloring of the tree.

Sample Input

```
2
0:
1: 0
```

```
8
0: 1 2 3
1: 4 5
2:
3: 6 7
4:
5:
6:
7:

0
```

Output for the Sample Input

```
3
11
```

Darko Aleksic, October 2007

Problem B

BANKRUPT BAKER

Wolfgang Puck has an extensive collection of cake recipes. They are separated into different binders depending on the type of cake. Although Wolfgang has restaurant franchises all over the world, he is in a period of hard times and is struggling to afford ingredients for his cakes. What cakes can he create with his small budget?

Input

On the first line you are given t ($1 \le t \le 100$), the number of binders. Each binder begins with *title*, the name of the binder, then on the next line m n b ($1 \le m, n \le 100$, $1 \le b \le 10^6$) where b is Wolfgang's budget in dollars. The next m lines are given as "*ingredient c*" (see sample input) where c ($0 \le c \le 5000$) is the price in dollars for one unit of ingredient.

Then follow n recipes. Each recipe begins with *name* on a line of its own, then on the very next line k ($1 \le k \le 100$). The following k lines are of the form "*requirement x*" (see sample input) where x is the number of units of the ingredient *requirement* used in the recipe *name*.

Output

For each binder, output the name of the binder in uppercase letters then on separate lines a list of recipes within Wolfgang's budget in increasing order of cost. If no such recipe exists, print "Too expensive!". If recipes have the same cost print them in lexicographical order. Print a blank line after each binder.

Sample Input

```
2
My Favourite Cheesecake
8 3 100
sugar 4
water 0
lemonjuice 3
creamcheese 20
vanilla 5
egg 5
```

```
cream 10
strawberry 5
Strawberry Whipped Cream
2
cream 5
strawberry 3
Scrumptious Caramel Topping
3
sugar 6
water 3
lemonjuice 1
Secret Cheesecake Base
5
creamcheese 3
sugar 5
vanilla 1
egg 6
cream 1
Million Dollar Cakes
3 1 999999
costlyflour 500
gold 4500
diamond 5000
Display Cake - Do Not Eat!
3
costlyflour 100
gold 100
diamond 100
```

Output for the Sample Input

```
MY FAVOURITE CHEESECAKE
Scrumptious Caramel Topping
Strawberry Whipped Cream

MILLION DOLLAR CAKES
Too expensive!
```

Sean McIntyre
Calgary Collegiate Programming Contest 2007

Problem C

COUNTING CHAOS

Wolfgang Puck's rival, Emeril Lagasse ("BAM!"), recently set the world culinary record in the category of smallest soufflé measuring in at a mere 2 cm! Wolfgang, not to be outdone, decided that he would set a culinary record of his own: the most symmetric marble cake in the world. This is clearly not an easy feat!

As we all know from Wolfgang's bestselling biography, he is a very superstitious chef. In his attempts to create the symmetric cake, he has vowed to remove the cake from the oven only at a palindromic time, i.e., a time that reads the same when read from left-to-right as right-to-left. Not including the current time, when is the next opportunity for Wolfgang to remove his cake?

Input

On the first line of the input you are given *n*, the number of attempts Wolfgang makes to make his symmetric cake. The following *n* lines contain a string formatted as "HH:MM" indicating the current time on a twenty-four hour clock. (So $0 \leq HH \leq 23$ and $0 \leq MM \leq 59$ and "00:00" follows "23:59")

Output

For each attempt, output a string indicating the next palindromic time (not including the current time) on a single line formatted as "hh:mm". When determining if HH:MM is palindromic, ignore all leading zeroes in HH. If HH is zero then ignore all leading zeroes in MM.

Sample Input

```
3
00:00
23:30
14:59
```

Output for the Sample Input

```
00:01
```

```
23:32
15:51
```

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Problem D

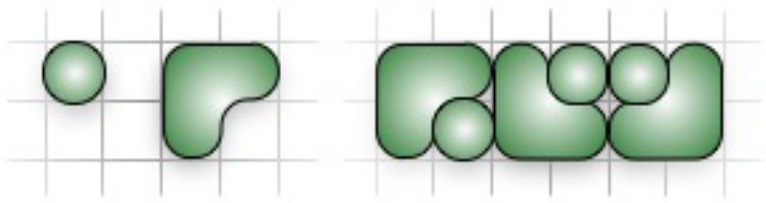
DELIVERY DEBACLE

Wolfgang Puck has two very peculiar habits:

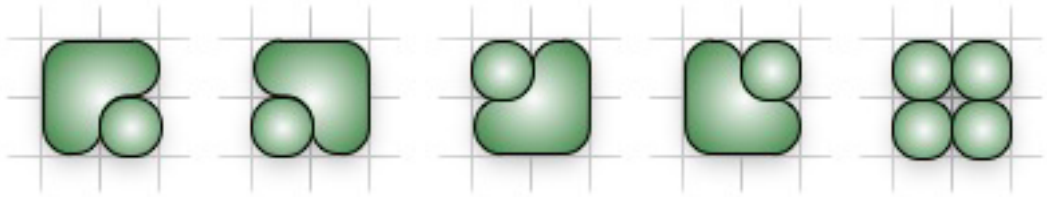
- I. He only makes two shapes of cakes. One is square and has an area of one unit. The other is L-shaped and has an area of three units.

- II. He will only deliver cakes packed in very specific box sizes. The boxes are always 2 units wide and are of varying length.

One day Wolfgang wondered in how many different ways he can pack his cakes into certain sized boxes. Can you help him?



The precise sizes of the cakes Wolfgang makes and one way to pack them in a box of length 6.



The five ways to pack a box of length 2.

Input

The input begins with t, the number of different box lengths. The following t lines contain an integer n ($1 \leq n \leq 40$).

Output

For each *n* output on a separate line the number of different ways to pack a 2-by-*n* box with cakes described above. Output is guaranteed to be less than 10^{18}.

Sample Input

```
2
1
2
```

Output for the Sample Input

```
1
5
```

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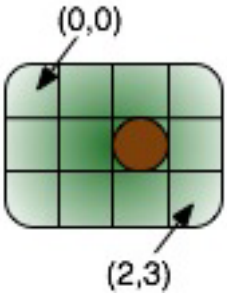
Problem E

EXCLUSIVELY EDIBLE



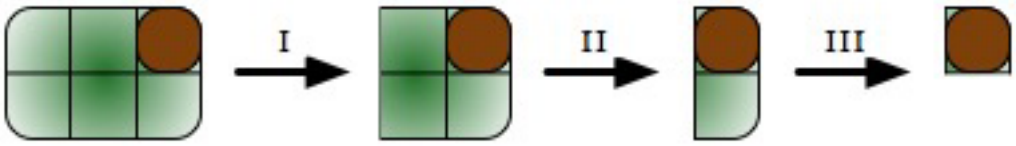
Hansel and Gretel like cakes, but especially the so called “grid cake" served in Wolfgang Puck's restaurants. It is made of *mn* pieces of different cakes, resembling a 2D *m*-by-*n* grid when looked at from above (hence the name).

The only thing that Hansel and Gretel do not like about grid cakes is that each of them has to contain a piece of the Scrumptious Caramel Topping cake. (Image of a three-by-four grid cake with brown Scrumptious Caramel Topping cake is shown) It turns out that the only reason Wolfgang Puck has the Scrumptious Caramel Topping cake in his recipe book is because he inherited it from his late great-great-grandmother.

Neither Hansel nor Gretel want to have the "bad" piece in their portion of the cake, so they came up with the following way to decide who gets the bad piece: first Hansel cuts a piece of the cake along the grid lines, then Gretel does the same and they keep alternating until there is only the Scrumptious Caramel Topping cake piece left and one of them is forced to take it.

For example, with a two-by-three grid cake, the illustrations below show the following steps:

- I. Hansel cuts the leftmost column. (Gretel is left with a two-by-two grid cake.)
- II. Gretel cuts the leftmost column. (Hansel is left with a one-by-two grid cake.)
- III. Hansel cuts the bottom square off. (Gretel is left with the piece of Scrumptious Caramel Topping cake.)



A sequence of cuts to determine whether Hansel or Gretel is getting the bad piece.

Hansel and Gretel have eaten many grid cakes together and have played this game so many times that they know who will take the bad piece before starting. In fact, if they observe Hansel will take the bad piece, then Gretel knows a strategy to ensure Hansel takes the bad piece. Hansel also knows this strategy.

Given the original cake and position of the Scrumptious Caramel Topping cake piece in the grid, who

will take the bad piece?

Input

The first line of the input file contains a number t ($1 \le t \le 100$), the number of test cases. Then t lines follow, each containing m n r c (separated by spaces) where m and n ($2 \le m, n \le 48$) are the width and the length of the cake and (r,c) is the zero-based position of the Scrumptious Caramel Topping cake piece in the grid cake ($0 \le r \le m$-1, $0 \le c \le n$-1).

Output

For each test case print the name of the person that gets the bad piece assuming that Hansel makes the first cut and that Hansel and Gretel always cut the cake at an optimal location (trying not to get the Scrumptious Caramel Topping cake piece). Note that "cut" here refers to a straight line cut (along a grid line) that separates the cake into two pieces.

Sample Input

```
2
2 3 0 2
11 11 5 5
```

Output for the Sample Input

```
Gretel
Hansel
```

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Problem F

FLIPPING FRUSTRATION

Wolfgang Puck is not doing so well financially and has accepted a position as a lowly chef at a restaurant franchise named after himself. He is not able to live his normal, lavish lifestyle and as a result he has recently developed some odd tendencies. One tendency in particular is that with his recipe books he can only flip a precise number of pages left (backwards) or a number of pages right (forwards).

Wolfgang must make a dish he knows to be on a certain page of his recipe book. If he starts from the first page, is he able to reach this page? If so, what is the least number of page flips he can make to reach this page?

Input

On the first line you are given c ($1 \leq c \leq 100$), the number of occurrences Wolfgang has with his flipping frustration. For each occurrence you are given $n\ l\ r\ t$ ($2 \leq n \leq 10^7$, $1 \leq l, r \leq$ n-1, $1 \leq t \leq$ n) on a line where n is the number of pages in the book, l is the interval left, r is the interval right, and t is the target page number.

Output

If it is possible to reach page t from page 1, output on a single line the minimum number of page flips. If it is not possible, print "uh-oh!" on a line.

Sample Input

```
5
10 5 4 1
1000 2 1 42
100 2 4 66
101 60 70 51
100 2 3 98
```

Output for the Sample Input

```
0
41
uh-oh!
uh-oh!
34
```

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Problem G

GOURMET GAMES

Wolfgang Puck is opening a new exclusive restaurant in Las Vegas and is looking for a chef. His nephew Hansel caught him thinking of posting an ad in newspapers. (Note: Wolfgang has heard of "this Internet thingy", but didn't find it interesting because one could not spread some Internet on a piece of bread, which is the mere minimum that has to be satisfied for something to be interesting, according to Mr. Puck.)

Hansel knows what the advantages of the Internet job postings are, but he came up with an even better idea - given the success of various reality TV shows and given the fact that the restaurant is opening in Las Vegas, why not organize a sort of a cook-off tournament that will decide who Mr. Puck will hire?

The idea basically combines the Iron Chef™ show with the World Series Of Poker™: Every show m cooks prepare a five-course meal for judges and the best one (according to the said judges) advances to the next round. All candidates are ranked based on the previous experience so, even if the number of the candidates is not divisible by m, some of them can get a "bye" and compete in later rounds. The winner of the final show gets the honour of being the chef in the best Wolfgang Puck's restaurant ever.

Hansel realized that even with the byes it might not be possible to hold a tournament with m chefs per show, so he is trying to find out what the best m for the given number of candidates is. If you can just help him by letting him know if he can run a tournament as described with n candidates and m chefs per show and, in the case he can, how many shows he needs, he will be so grateful that he might even convince Mr. Puck to share the Secret Cheesecake Base Recipe with you.

Input

Input file starts with the line containing a single integer t, the number of test cases. Next t lines each contain two integers separated by spaces, n and m ($2 \le n \le 10000$, $2 \le m \le n$), where n is the total number of candidates and m is the number of chefs participating in a single TV show.

Output

For each test case print the number of shows that need to be run to get the new chef. In the case that the tournament cannot be run with given *n* and *m*, print "cannot do this".

Sample Input

```
3
3 2
4 3
4 4
```

Output for the Sample Input

```
2
cannot do this
1
```

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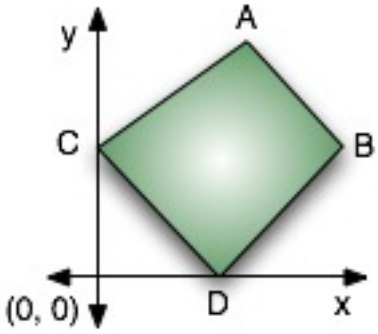
Problem H

HARDLY HARD

You have been given the task of cutting out a quadrilateral slice of cake out of a larger, rectangular cake. You must find the slice with the smallest perimeter that satisfies the following constraints. If the cake is of size 10000-by-10000 units and is represented using the first quadrant of the Cartesian plane, then your slice is quadrilateral ABCD (see figure). Points A and B are fixed and will be given to you. Also, A,B will lie on a negatively sloping line. Furthermore, points C and D must lie on the positive y-axis and positive x-axis respectively, but it is up to you to determine where these two points should be. A,B,C,D will be distinct points.



Output the minimum perimeter of your slice of cake.

Input

On the first line you will be given n ($1 \leq n \leq 100$), the number of test cases. The following n lines each contain $ax\ ay\ bx\ by$ ($0 < ax, ay, bx, by \leq 10000.0$), the coordinates of points A and B respectively.

Output

For each test case, output the perimeter accurate to 3 decimal places on its own line.

Sample Input

```
1
3.0 1.0 1.0 2.0
```

Output for the Sample Input

```
7.236
```

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