

Round 3 2015

**A. Fairland**[B. Smoothing Window](#)[C. Runaway Quail](#)[D. Log Set](#)[E. River Flow](#)[Contest Analysis](#)[Questions asked](#)

## Submissions

## Fairland

3pt Not attempted  
319/328 users  
correct (97%)9pt Not attempted  
212/291 users  
correct (73%)

## Smoothing Window

6pt Not attempted  
194/268 users  
correct (72%)7pt Not attempted  
184/194 users  
correct (95%)

## Runaway Quail

8pt Not attempted  
45/107 users  
correct (42%)15pt Not attempted  
16/20 users correct  
(80%)

## Log Set

6pt Not attempted  
197/212 users  
correct (93%)19pt Not attempted  
55/109 users  
correct (50%)

## River Flow

10pt Not attempted  
15/43 users correct  
(35%)17pt Not attempted  
11/11 users correct  
(100%)

## Top Scores

rng..58	73
tkociumaka	73
Gennady.Korotkevich	73
Xhark	73
linguo	72
iwi	68
tczajka	64
simonlindholm	60
kevinsogo	60
vepifanov	58

**Problem A. Fairland**

This contest is open for practice. You can try every problem as many times as you like, though we won't keep track of which problems you solve. Read the [Quick-Start Guide](#) to get started.

Small input  
3 points

Solve A-small

Large input  
9 points

Solve A-large

**Problem**

The country of Fairland has very strict laws governing how companies organize and pay their employees:

1. Each company must have exactly one CEO, who has no manager.
2. Every employee except for the CEO must have exactly one manager. (This means that the org chart showing all of the employees in a company is a tree, without cycles.)
3. As long as an employee is working for the company, their manager must never change. This means that if a manager leaves, then all of the employees reporting to that manager must also leave.
4. The CEO must never leave the company.
5. Every employee receives a salary -- some amount of Fairland dollars per year. An employee's salary must never change.
6. Different employees may have different salaries, and an employee's salary is not necessarily correlated with where in the org chart that employee is.

The government of Fairland has just passed one additional law:

7. The difference between the largest salary and the smallest salary in the whole company must be at most **D** Fairland dollars.

Marie is the CEO of the Fairland General Stuff Corporation, and she has to ensure that her company complies with the new law. This may require laying off some employees. She has the list of the company's employees, their managers, and their salaries. What is the largest number of employees she can keep, including herself?

**Input**

The first line of the input gives the number of test cases, **T**. **T** test cases follow. Each case begins with one line containing two space-separated integers **N** (the number of employees) and **D** (the maximum allowed salary difference). This is followed by one line with four space-separated integers (**S<sub>0</sub>**, **A<sub>s</sub>**, **C<sub>s</sub>**, **R<sub>s</sub>**) and then another line with four more space-separated integers (**M<sub>0</sub>**, **A<sub>m</sub>**, **C<sub>m</sub>** and **R<sub>m</sub>**). These last eight integers define the following sequences:

- $S_{i+1} = (S_i * A_s + C_s) \bmod R_s$
- $M_{i+1} = (M_i * A_m + C_m) \bmod R_m$

Marie's employee ID is 0, and all other employees have IDs from 1 to **N** - 1, inclusive. The salary of employee **i** is **S<sub>i</sub>**. For every employee **i** other than Marie, the manager is **M<sub>i</sub> mod i**. (Note that this means that **M<sub>0</sub>** does not affect Marie's manager -- she has none!)

**Output**

For each test case, output one line containing "Case #x: y", where x is the test case number (starting from 1) and y is the largest number of employees Marie can keep at the company, including herself, such that all of laws 1-7 are obeyed.

**Limits**

- $1 \leq T \leq 100$ .
- $0 \leq S_0 < R_s$ .
- $0 \leq M_0 < R_m$ .
- $0 \leq A_s, A_m \leq 1000$ .
- $0 \leq C_s, C_m \leq 10^9$ .

**Small dataset**

- $1 \leq N \leq 1000$ .
- $1 \leq D \leq 1000$ .
- $1 \leq R_s, R_m \leq 1000$ .

**Large dataset**

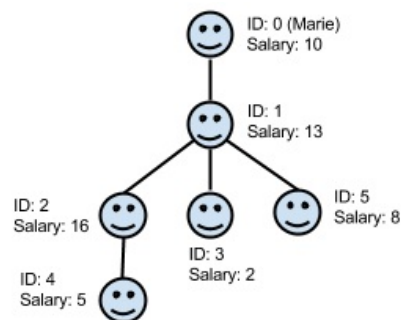
$1 \leq N \leq 10^6$ .  
 $1 \leq D \leq 10^6$ .  
 $1 \leq R_s, R_m \leq 10^6$ .

### Sample

Input	Output
3	Case #1: 1
1 395	Case #2: 3
18 246 615815 60	Case #3: 5
73 228 14618 195	
6 5	
10 1 3 17	
5 2 7 19	
10 13	
28 931 601463 36	
231 539 556432 258	

In Case #1, the company has only a CEO and no other employees, but it does not violate any of the laws, so no changes need to be made.

Here is the org chart for Case #2:



The optimal strategy is to save employees 0, 1, and 5 (who have salaries of 10, 13, and 8, respectively). It is not possible to save employee 2, for example, because her salary is more than 5 away from employee 0's salary of 10; since employee 0 cannot be laid off, employee 2 must be laid off (along with all employees who report to her).

If you want to check your sequences for employees 1 through 5, they are:

**S:** 13, 16, 2, 5, 8

**M:** 17, 3, 13, 14, 16

Manager numbers: 17 % 1 = 0, 3 % 2 = 1, 13 % 3 = 1, 14 % 4 = 2, 16 % 5 = 1

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