



**CROATIAN NATIONALS 2008**  
Primošten, April 15–20

**HIGH SCHOOL, PASCAL/C/C++**  
Senior category, competition day 2

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| <b>TASK</b>                          | <b>POKLON</b>   | <b>TVRTKA</b> | <b>SLON</b> |
|--------------------------------------|-----------------|---------------|-------------|
| <b>input</b>                         | standard input  |               |             |
| <b>output</b>                        | standard output |               |             |
| <b>time limit</b><br>(per test case) | 1 second        | 1 second      | 1.5 seconds |
| <b>memory limit</b><br>(heap+stack)  | 64 MB           |               |             |
| <b>points</b>                        | <b>50</b>       | <b>70</b>     | <b>80</b>   |
|                                      | <b>200</b>      |               |             |



Grandma has two grandchildren who she likes to give gifts to. Today she bought them  $N$  gifts of various prices, which the children have to divide among themselves. The children alternate in taking one gift each, starting with the older child. Greedy as kids are, they always take the **most expensive** remaining gift.

Grandma knows that the older child will not be happy unless the total value of his gifts is at least  $A$  more than the other kid's. The younger child will not be happy if the value of the older kid's gifts is more than  $B$  more his own. In other words, the **difference of the total values of gifts** must be **between  $A$  and  $B$** , inclusive, to make both kids happy.

The values of gifts are positive integers. The value of each gift is clearly printed on the gift, except on one gift. After shopping, but before bringing the gifts home, grandma decided to stick a phony price tag onto that one gift so that **both kids are happy** after they have split the gifts. Of course, the phony price must also be an integer (or the kids will find it suspicious).

Write a program that determines **how many different prices** she can put on the unlabeled gift.

### INPUT

The first line contains three integers  $A$ ,  $B$  and  $N$  ( $1 \leq A \leq B \leq 10^9$ ,  $1 \leq N \leq 100\,000$ ) separated by spaces. The numbers  $A$  and  $B$  represent the kids' conditions, while the number  $N$  is the number of gifts.

Each of the following  $N-1$  lines contains the price of one gift. All prices are integers less than  $10^9$ . The prices will be sorted in descending order. The unlabeled gift does not appear in the input, of course.

### OUTPUT

Output a single integer – the number of different price tags grandma can choose.

### BODOVANJE

In a set of test cases worth a total of 80% points, the prices and the numbers  $A$  and  $B$  will be less than 10000. In a subset of that set, worth total 50% points,  $N$  will additionally be less than 100.

### EXAMPLE TEST DATA

|               |               |               |
|---------------|---------------|---------------|
| <b>input</b>  | <b>Input</b>  | <b>input</b>  |
| 3 3 4         | 50 60 3       | 6 15 7        |
| 5             | 100           | 17            |
| 5             | 20            | 13            |
| 5             |               | 10            |
| <b>output</b> | <b>output</b> | 10            |
| 2             | 22            | 6             |
|               |               | 2             |
|               |               | <b>output</b> |
|               |               | 23            |



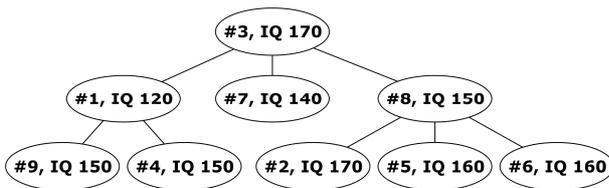
A software company has  $N$  employees. Each employee, with the exception of the head of the company, has a **manager**. The head of the company is manager to at least one employee. There are no cycles in the management structure (an employee cannot be, directly or indirectly, superior to himself). In other words, there is a tree-like hierarchy in the company.

A **workgroup** consists of an employee  $E$  and all employees he manages. We say that  $E$  is the manager of that workgroup.

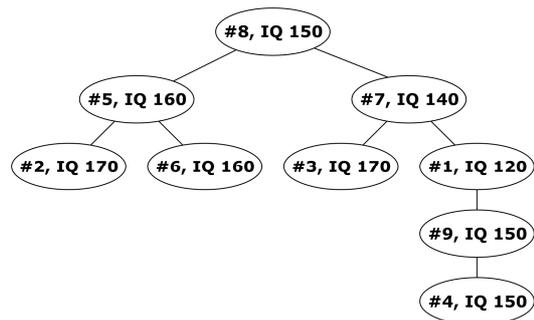
Each employee's intelligence quotient (IQ) is represented by an integer.

The company's management has decided to reorganize the hierarchy in order to improve efficiency. The new hierarchy must meet the following requirements:

1. Each workgroup in the new hierarchy should have no more than 3 members.
2. In each workgroup in the new hierarchy, no more than one member may have a higher IQ than the manager of the workgroup.
3. Every employee and his (her) new manager must have belonged to the same workgroup in the old hierarchy.



*The initial hierarchy in the company. Each node in the tree shows the index of the employee and his (her) IQ. This hierarchy does not meet the above requirements since there are two workgroups with four members (requirement 1 is not met) and, furthermore, workgroups with managers 1 and 8 do not meet requirement 2.*



*One possible hierarchy after reorganizing. All three requirements are met.*

Write a program that, given the description of the initial hierarchy, reorganizes the company so that the new hierarchy meets all of the above requirements.

The input data will be such that a solution will always exist, although it will not necessarily be unique.

## INPUT

The first line of input contains an integer  $N$  ( $2 \leq N \leq 1000$ ), the number of employees in the company.

The second line of input contains  $N$  integers separated by single spaces. Each number represents the intelligence quotient of one employee. Employees are numbered 1 to  $N$  in the order in which their IQs are given. All IQs are between 50 and 200, inclusive.

Each of the following  $N-1$  lines contains two integers  $M$  and  $E$  ( $1 \leq M \leq N$ ,  $1 \leq E \leq N$ ), meaning that employee  $M$  is the manager of employee  $E$  in the initial hierarchy.

## OUTPUT

Output should consist of exactly  $N-1$  lines.

Each line of output should contain two integers  $M$  and  $E$  separated by a space, meaning that the employee  $M$  is the manager of employee  $E$  in the new hierarchy. The new hierarchy should satisfy all the requirements from the task description.



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**Task TVRTKA**

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## **BODOVANJE**

In a set of test cases worth a total of 40% points, all employees will have the same intelligence quotient.

### **EXAMPLE TEST DATA**

**input**

```
4
140 120 160 130
1 2
1 3
1 4
```

**output**

```
1 2
1 3
2 4
```

**input**

```
9
120 170 170 150 160 160 140 150 150
3 1
3 7
3 8
1 9
1 4
8 2
8 5
8 6
```

**output**

```
8 5
8 7
5 2
5 6
7 3
7 1
1 9
9 4
```



An elephant lives by a lake with  $N$  plants on the surface. The lake can be modeled by a coordinate plane, with plants at points with integer coordinates.

Every morning after waking up, the elephant performs his morning exercise, happily jumping from plant to plant. For reasons best left undiscussed, the elephant can always jump only to another plant with **both coordinates larger** than the coordinates of the plant it is currently on. In other words, from plant  $(x_1, y_1)$  the elephant can jump to plant  $(x_2, y_2)$  only if  $x_2 > x_1$  and  $y_2 > y_1$ . The elephant can start his exercise at any plant on the lake.

Write a program that, given the coordinates of all plants, calculates the length of the **longest sequence of plants** the elephant can visit. Additionally, calculate **the number of different such longest sequences**. Because this second number can be large, calculate it modulo **1000000007**.

### INPUT

The first line contains the integer  $N$  ( $1 \leq N \leq 300000$ ), the number of plants.

Each of the following  $N$  lines contains the coordinates of one plant, two integers between 0 and  $10^9$ . No two plants will have the same pair of coordinates.

### OUTPUT

On the first line output the length of the longest sequence of plants the elephant can jump on.

On the second line output the number of such sequences of maximum length, modulo 1000000007.

You may score points even when your output is not completely correct (see the following section) so be sure to always output two integers, even if one of them is obviously incorrect.

### SCORING

Getting either of the two numbers correct will give you 50% for that test case.

Furthermore, in a set of test cases worth a total of 50% points, the number  $N$  will be less than 1000.

### EXAMPLE TEST DATA

|               |               |               |
|---------------|---------------|---------------|
| <b>input</b>  | <b>input</b>  | <b>input</b>  |
| 4             | 6             | 11            |
| 1 1           | 1 3           | 8 6           |
| 4 2           | 2 2           | 7 4           |
| 2 3           | 3 1           | 5 4           |
| 3 4           | 5 3           | 5 1           |
| <b>output</b> | 4 4           | 5 6           |
| 3             | 3 5           | 6 2           |
| 1             | <b>output</b> | 3 2           |
|               | 2             | 4 3           |
|               | 7             | 4 5           |
|               |               | 3 5           |
|               |               | 2 4           |
|               |               | <b>output</b> |
|               |               | 4             |
|               |               | 3             |