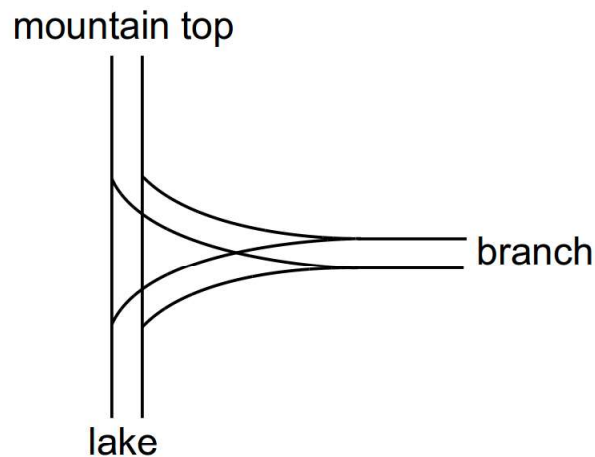


## Problem S3: The Geneva Confection

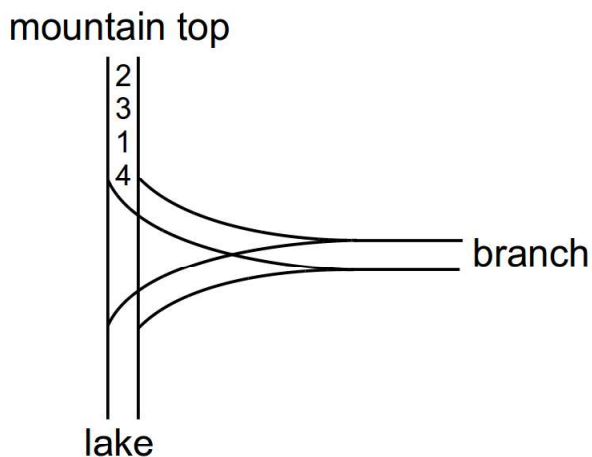
### Problem Description

In order to ensure peace and prosperity for future generations, the United Nations is creating the world's largest candy. The ingredients must be taken in railway cars from the top of a mountain and poured into Lake Geneva. The railway system goes steeply from the mountaintop down to the lake, with a T-shaped branch in the middle as shown below.



Right now, each of the  $N$  ingredients is in its own railway car. Each railway car is assigned a positive integer from 1 to  $N$ . The ingredients must be poured into the lake in the order  $1, 2, 3, \dots, N$  but the railway cars are lined up in some random order. The difficulty is that, because of the especially heavy gravity today, you can only move cars downhill to the lake, or sideways on the branch line. Is it still possible to pour the ingredients into the lake in the order  $1, 2, 3, \dots, N$ ?

For example, if the cars were in the order 2, 3, 1, 4, we can slide these into the lake in order as described below:



- Slide car 4 out to the branch
- Slide car 1 into the lake
- Slide car 3 out to the branch
- Slide car 2 into the lake
- Slide car 3 from the branch into the lake
- Slide car 4 from the branch into the lake

**Input Specification**

The first line will contain the number  $T$  ( $1 \leq T \leq 10$ ) which is the number of different tests that will be run. Each test has the form of an integer  $N$  ( $1 \leq N \leq 100\,000$ ) on the first line of the test, followed by a list of the  $N$  cars listed from top to bottom. The cars will always use the numbers from 1 to  $N$  in some order.

**Output Specification**

For each test, output one line which will contain either Y (for “yum”) if the recipe can be completed, and N otherwise.

**Sample Input**

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

**Output for Sample Input**

```
Y
N
```

## Problem S4: Tinted Glass Window

### Problem Description

You are laying  $N$  rectangular pieces of grey-tinted glass to make a stained glass window. Each piece of glass adds an integer value “tint-factor”. Where two pieces of glass overlap, the tint-factor is the sum of their tint-factors.

You know the desired position for each piece of glass and these pieces of glass are placed such that the sides of each rectangle are parallel to either the  $x$ -axis or the  $y$ -axis (that is, there are no “diagonal” pieces of glass).

You would like to know the total area of the finished stained glass window with a tint-factor of at least  $T$ .

### Input Specification

The first line of input is the integer  $N$  ( $1 \leq N \leq 1000$ ), the number of pieces of glass. The second line of input is the integer  $T$  ( $1 \leq T \leq 1\,000\,000\,000$ ), the threshold for the tint-factor. Each of the next  $N$  lines contain five integers, representing the position of the top-left and bottom-right corners of the  $i$ th piece of tinted glass followed by the tint-factor of that piece of glass. Specifically, the integers are placed in the order  $x_l\ y_t\ x_r\ y_b\ t_i$ , where the top-left corner is at  $(x_l, y_t)$  and the bottom-right corner is at  $(x_r, y_b)$ , and tint-factor is  $t_i$ . You can assume that  $1 \leq t_i \leq 1\,000\,000$ . The top-most, left-most co-ordinate where glass can be placed is  $(0, 0)$  and you may assume  $0 \leq x_l < x_r \leq K$  and  $0 < y_t < y_b \leq K$ , and

The following additional constraints will apply.

- At least 10% of the marks will be for test cases where  $N \leq 100$  and  $K \leq 100$ ;
- at least 30% of the marks will be for test cases where  $N \leq 1000$  and  $K \leq 1000$ ;
- at least 40% of the marks will be for test cases where  $N \leq 100$  and  $K \leq 1\,000\,000\,000$ ;
- the remaining marks will be for test cases where  $N \leq 1000$  and  $K \leq 1\,000\,000\,000$ .

### Output Specification

Output the total area of the finished stained glass window which has a tint-factor of at least  $T$ . All output will be less than  $2^{64}$ , and the output for some test cases will be larger than  $2^{32}$ .

### Sample Input

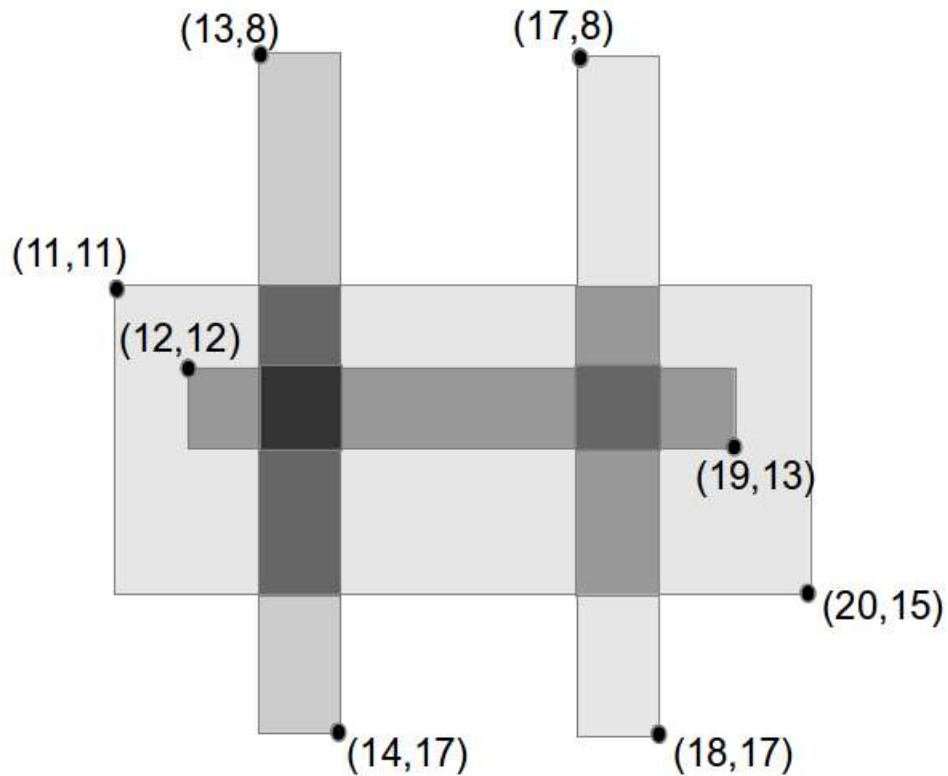
```
4
3
11 11 20 15 1
13 8 14 17 2
17 8 18 17 1
12 12 19 13 1
```

### Output for Sample Input

5

### Explanation of Output for Sample Input

There are 4 pieces of glass used. There are two regions of glass which have a tint-factor greater than or equal to 3: one region between (13, 11) and (14, 15) (which has tint-factor of 3, except for a unit square with tint-factor 4), and another region between (17, 12) and (18, 13) (with tint-factor 3). In total, these two regions have 5 square units of glass with tint-factor greater than or equal to 3, as shown on the diagram below.



## Problem S5: Lazy Fox

### Problem Description

You have a pet Fox who loves treats. You have  $N$  neighbours at distinct locations (described as points on the Cartesian plane) which hand out treats to your pet Fox, and each neighbour has an unlimited number of treats to give out. The origin (which is where the Fox starts) will not be one of these  $N$  locations.

What does the Fox say, in order to get these treats? That is a good question, but not our concern.

The Fox moves from location to location to gather exactly one treat from each location on each visit. He can revisit any previous location, but cannot visit the same location on two *consecutive* visits.

Your Fox is very lazy. The distance your Fox is willing to travel after each treat will strictly decrease. Specifically, the distance from the origin to his first treat location must be larger than the distance from his first treat location to his second treat location, which in turn is larger than the distance between his second treat location and his third treat location, and so on.

What is the largest number of treats your Fox gathers?

### Input Specification

The first line contains the integer  $N$  ( $1 \leq N \leq 2000$ ). The next  $N$  lines each contain  $X_i$ , followed by a space, followed by  $Y_i$ , for  $i = 1..N$  ( $-10\,000 \leq X_i, Y_i \leq 10\,000$ ) representing the coordinates of the  $i$ th location. The following additional constraints will apply.

- At least 20% of the marks will be for test cases where  $N \leq 50$ ;
- at least 40% of the marks will be for test cases where  $N \leq 200$ ;
- the remaining marks will be for test cases where  $N \leq 2000$ .

### Output Specification

The output is one integer, the largest number of treats your Fox can gather.

### Sample Input

```
5
5 8
4 10
3 1
3 2
3 3
```

### Output for Sample Input

```
6
```

**Explanation of Output for Sample Input**

The Fox performs the visits in the following order (with the indicated distances):

- $(0, 0)$  to  $(4, 10)$  with distance  $\sqrt{116}$ ;
- $(4, 10)$  to  $(3, 1)$  with distance  $\sqrt{82}$ ;
- $(3, 1)$  to  $(5, 8)$  with distance  $\sqrt{53}$ ;
- $(5, 8)$  to  $(3, 3)$  with distance  $\sqrt{29}$ ;
- $(3, 3)$  to  $(3, 1)$  with distance 2;
- $(3, 1)$  to  $(3, 2)$  with distance 1.