Problem 1. Maximum Sub-sequence Product

(Time Limit: 2 seconds)

Problem Description

Bob needs money, and since he knows you are here, he decided to gamble intelligently. The game is rather simple: each player gets a sequence of integers. The players must determine, by using their mega-pocket computers, which is the maximum product value which can be computed with nonempty sub-sequences of consecutive numbers from the given sequence.

The winner is the one which gets first the right result.

Can you help Bob with a program to compute quickly the wanted product, particularly when the sequence is quite long?

Input Format

The input contains sequences of numbers. Each number will have at most 5 digits. There will be at most 100 numbers in each sequence. Each sequence starts on a new line and may continue on several subsequent lines.

Output Format

The maximum sub-sequence product for each sequence must be written on the standard output, on a different line. A simple example is illustrated in the sample below.

Example

Sample Input:	**Sample Output:**
1 2 3 -5 -2 2 -30 -8 -1 0 -2	6 120 -8 0

Problem 2. Civil War in Bacteria

(Time Limit: 1 seconds)

Problem Description

Antibiotic are the primary treatment in hospitals for healing various infectious diseases. With the discovery of antimicrobials in the 1940s, scientists prophesied the defeat of infectious diseases that had plagued humankind throughout history. However, the remarkable healing power of antibiotics was inappropriately used. This misuse and overuse of antibiotics lead to antibiotic resistance among bacteria. For instance, medical doctors have observed that bacteria have gained resistance to the last resort of antibiotic called Colistin. Therefore, scientists started to develop gene-editing therapy, which aims to modify the DNA of a few bacteria in order to create civil war among them. Because after couple generations, the gene sequences of entire bacteria population will become diverse and they will start attacking each other if the gene sequences of any two bacteria differs too much. However, the attack of one bacterium to another will cause immediate death of both. Therefore, if there is more than one attacking targets from one bacterium, this bacterium can only choose one of them and vice versa. Given a list of attacking pairs of bacteria, you are asked to compute the maximum number of attacking pairs that can be obtained, in order to estimate the efficiency of this gene-editing therapy.

Technical Specification

- A positive integer n, $1 \leq n \leq 100$, representing the number of bacteria in the population.
- Each bacterium has a unique identity ranging from 1 to n.
- A positive integer m, $1 \leq m \leq 1000$, representing the number of attacking pairs.

Input Format

The first line of the input contains an integer indicating the number of test cases. Each test case starts with a line containing two integers separated by a white space. The first integer is the number of bacteria (n), and second integer is the number of attacking pairs (m). The following m lines contain the identity of two attacking bacteria separated by a white space.

Output Format

For each test case, output the maximum number of attacking pairs that can be obtained in each line.

Example

Sample Input:	**Sample Output:**
2 3 3 1 2 2 3 3 1 5 6 1 2 2 3 3 1 2 4 4 5 5 3	1 2

Problem 3. Strung Beads

(Time Limit: 1 second)

Problem Description

The Creative Jewelry Studio is designing strung beads for its client by using two types of beads. The costs of each type A and type B bead are 4 and 2 cents respectively.

Let m be a nonnegative integer. How many different ways are possible to design a strung bead such that it costs exactly m cents (the cost of materials except beads is ignored)? We assume that each strung bead has a head and a tail. Hence, for instance, AAB and BAA represent different strung beads. In addition, we consider the empty string (i.e., a string without any beads between its head and tail) as a (albeit special) kind of strung bead. As an example, when $m = 6$, there are three different ways (i.e., AB; BA; BBB) to design a strung bead such that it costs exactly 6 cents.

Technical Specification

- The cost for each strung bead must satisfy $0 \le m \le 160$.

Input Format

The first line is an integer which indicates the number of test cases. Each case consists of exactly one line which contains a nonnegative integer m.

Output Format

For each case, print exactly one line which must contain a nonnegative integer denoting the number of different ways to design a strung bead such that it costs exactly m cents.

Example

Sample Input:	**Sample Output:**
2 6 9	3 0

Problem 4. Improvement

(Time Limit: 1 seconds)

Problem Description

Peter is a programmer. He has designed the following algorithm to solve some problem.

```
Algorithm Foo
Input: integers s(i) and t(i) for 0≤i<N, where 0≤s(i)≤t(i)<N;
Initially D[i]=0 for 0≤i<N;
For i= 0 to N-1 do
   For j=s(i) to t(i) do
     D[j]=D[j]+1;
   For j=0 to N-1 do
     D[j]=max{D[k]: k≤j}; // prefix maximum
End of i-loop
output D[N-1];
```

However, as you can see, the algorithm takes O(*N**N*) time and is not efficient enough. Your task is to design a more efficient algorithm to do the same thing as the previous algorithm.

Technical Specification

- The number of test cases is at most 9.
- For each test case, the number *N* is between 1 and 100000.

Input Format

The test file contains several test cases. The first line of each test case is the number *N*. In the next *N* lines, each line contains s(*i*) and t(*i*) for *i* from 0 to *N*-1. There is a space between two integers. The case *N*=0 denotes the end of input, and you do not need to process it.

Output Format

For each test case, output the result in one line.

Example

Sample Input:	**Sample Output:**
5 1 3 0 1 3 4 0 0 2 3 0	4

Problem 5. Cellophane

(Time Limit: 6 seconds)

Problem Description

Cellophane is a thin, transparent sheet made of regenerated cellulose. It is widely used for many purposes, such as decoration and candy wrapping. Due to its diverse usage, it has been made colorful. The most basic and popular colors include red, yellow, and blue. Interestingly, we may obtain other colors by overlaying cellophanes of two different colors. For example, by overlaying red and yellow cellophanes, the color becomes orange; by overlaying red and blue cellophanes, the color becomes purple; and by overlaying yellow and blue cellophanes, the color becomes green. Furthermore, if we overlay cellophanes of all the three basic colors, the color would become black. See Table 1 for a summary.

Red + Yellow = Orange
Red + Blue = Purple
Yellow + Blue = Green
Red + Yellow + Blue = Black

Table 1. The mixture of colors.

Shining Star, a cell phone company, plans to decorate all the offices by pasting cellophanes (of basic colors) on the white walls. The manager of Shining Star believes that the work efficiency of his employees can be improved if the colors on the wall are good enough. In the manager’s opinion, it is good if the area of each color on the wall is neither too large nor too small. The wall and the cellophanes that are going to be pasted are both rectangular. When pasting a cellophane, its sides must be parallel to the corresponding sides of the wall. Note that the cellophanes cannot be pasted outside the wall; however, they may coincide on the edges. A valid pasting is given in Figure 1.

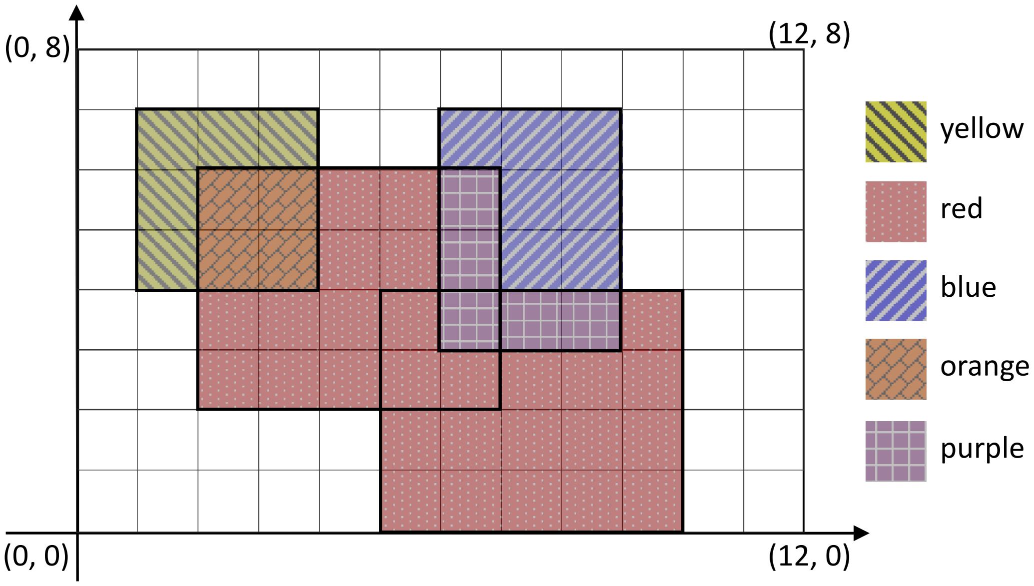

Figure 1. A valid pasting of four cellophanes: two red, one yellow, and one blue.

Now, given a valid pasting of cellophanes, the manager of Shining Star asks you to compute the area of each color generated by the cellophanes, so that he can tell if the pasting is good or not. Note that those regions that are not covered by the cellophanes remain white. Consider the example in Figure 1, in which the wall is of size 96 (= 12 × 8) and there are four cellophanes on the wall. In this example, the areas of red, yellow, blue, purple, orange, and white colors are 27, 5, 7, 5, 4, and 48, respectively.

Technical Specification

- The bottom-left corner of each wall has coordinate (0, 0) and the top-right corner has integer coordinate (w, h) satisfying $10 \leq w, h \leq 10^8$.
- The number of cellophanes, n: $2 \leq n \leq 10^5$.
- Each corner of a cellophane has integer coordinates (x, y) satisfying $0 \leq x, y \leq 10^8$. Every cellophane is guaranteed to be completely inside the wall.

Input Format

There are at most 15 test cases. Each test case describes a valid pasting of cellophanes on a wall in a number of lines. The first line contains two integers w and h, $10 \leq w, h \leq 108$, indicating the coordinate of the top-right corner of the wall. The second line contains an integer n, $2 \leq n \leq 105$, indicating the number of cellophanes. Then, n lines follow. Each of the n lines consists of a capital letter $c \in$ {'R', 'Y', 'B'} followed by four integers x_1, y_1, x_2, and y_2 ($0 \leq x_1 \leq x_2 \leq w$, $0 \leq y_1 \leq y_2 \leq h$), indicating a cellophane of color c whose bottom-left corner is (x_1, y_1) and top-right corner is (x_2, y_2). The capital letters 'R', 'Y', and 'B' denote red, yellow, and blue, respectively. The last test case is followed by a line containing two zeroes.

Output Format

For each test case, print a line containing the test case number (beginning with 1) followed by eight integers, indicating the areas of red, yellow, blue, green, purple, orange, black, and white, respectively. The integers are separated by a whitespace. Use the format of the sample output.

Example

Sample Input:	**Sample Output:**
12 8 4 R 2 2 7 6 Y 1 4 4 7 R 5 0 10 4 B 6 3 9 7 12 10 3 R 0 5 5 10 Y 3 2 8 8 B 4 3 10 9 0 0	Case 1: 27 5 7 0 5 4 0 48 Case 2: 18 7 15 17 1 3 3 56