Rectangles of Set Bits

Problem Code: **THREEARE**

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You are given a grid with 3 rows and N columns. Each cell in the grid contains the value 0 initially. You perform several operations of the following type on the grid

Pick a row, say r. Pick a start column and end column, say s and e. Of course $1 \le s \le e \le N$. Now, set all values in the grid in row r, from column s to column e to 1.

After you perform all the operations, you wish to find subgrids in this grid (or rectangles, if you please) which contain only 1s. Most importantly, you wish to find the rectangle that has the largest area. Print the area of this rectangle.

Input

The first line of input contains a number T, the number of test cases. The first line of each test case contains the number N and M respectively, separated by a single space. N is the number of columns in the grid. M is the number of operations you perform on the grid. Each of the next M lines contain three integers R, C1 and C2 respectively to describe the operation. R is the row in which the operation is performed. C1 and C2 are the start and end columns respectively. You may assume that $1 \le C1 \le C2 \le N$.

Output

For each test case output a single number on a line by itself. This number should be the area of the largest rectangle that can be chosen on the grid - which contains only of 1s.

Constraints

```
1 ≤ T ≤ 100
1 ≤ N ≤ 1000000
1 ≤ M ≤ 1000
```

Attention

The test data is designed such that solutions that simulate each operation in O(N) will get TLE. You should be able to solve each test case in O(N). Hint: Convert each operation to a pair of "start" and "end" events. Observe that the order of operations doesn't matter. Thus you can process the events in increasing order of columns. You can also simply store how many events start / end at each cell (since all events are alike and have idempotent effect). Now, you can walk through the grid column by column maintaining the longest streak of 1s towards the left in each row. This helps in considering the best possible rectangles with their right edge at current column.

Sample Input

```
3
5 2
1 1 4
2 3 5
10 3
1 1 8
2 2 10
3 1 9
5 2
2 1 4
3 3 5
```

Sample Output

```
4
21
4
```

Explanation
In the first test case the final grid looks like

```
11110
00111
00000
```

We can see that the largest rectangle with 1s has the area 4. There are two such rectangles. 1,1 - 1,4. And 1,3 - 2,4.

In the second test case the final grid looks like

```
1111111100
0111111111
1111111110
```

The largest rectangle is 1,2 - 3,8. The area of this rectangle is 3*7=21.

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Source Limit:	50000 Bytes
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Comments

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