CCC '14 S4 - Tinted Glass Window

Canadian Computing Competition: 2014 Stage 1, Senior #4

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 ($1 \le N \le 1\,000$), the number of pieces of glass. The second line of input is the integer T ($1 \le T \le 1\,000\,000\,000$), 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 ith 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 $1 \le t_i \le 1\,000\,000$. The top-most, left-most co-ordinate where glass can be placed is $(0, 0)$ and you may assume $0 \le x_l < x_r \le K$ and $0 < y_t < y_b \le K$, and

The following additional constraints will apply.

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

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
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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.

(13,8)

(17,8)

(11,11)

(12,12)

(19,13)

(20,15)

(14,17)

(18,17)