5_效益評估 (Benefit Evaluation)

(15分)

時間限制: 1 second
記憶體限制: 256 MB

題目敘述

小明身為一位探險家，他非常享受在探險中還能收穫寶藏的過程。今天他來到了一大片富含寶藏的土地，這片土地可以看成一個 $10^4 \times 10^4$ 的表格，透過他的專業夥伴小義的分析，這塊土地上有 N 片可疑的區域，每片可疑的區域會形成一個長方形，對於一片可疑的區域，小明只要有辦法將其從頭到尾整個搜尋一遍，他就可以獲得價值為 C 的寶藏。

但很不巧的，小明是一個很單純的人，給他 N 片區域請他每片分別搜尋一遍對他來說實在是太複雜了，因此，小義決定指定**恰好一個長方形**區域，並讓小明只要專心搜尋這個長方形區域就好。但讓小明搜尋太大片的區域又會害他過份勞碌，所以小義也希望不要選定太大片的區域。

因此小義委託了擅長演算法的你，是否能為他評估一個最好的長方形區域，使得他定義出來的效益值，「被完整包含在選定的長方形內的可疑區域數量 $\times C$」減去「選定的長方形區域面積」，盡量大？注意到不選擇任何長方形也可以是一種選項，這時候的效益值為 0。

輸入格式

第一行包含兩個正整數 N, C，總共有 N 片可疑的區域，以及小明完整搜尋完一片區域後可以得到的價值。

接下來 N 行，每行包含四個正整數 d_i, l_i, u_i, r_i，代表第 i 片可疑區域形成一個左下角在 (d_i, l_i)、右上角在 (u_i, r_i) 的長方形。

輸出格式

請輸出在最佳的評估下，效益值的最大值。

資料範圍

- $1 \leq N \leq 100$
- $1 \leq C \leq 10^7$
- $1 \leq d_i \leq u_i \leq 10^4$
- $1 \leq l_i \leq r_i \leq 10^4$

測試範例

輸入範例 1

```
3 7
1 2 3 3
4 1 5 3
1 4 3 5
```

輸出範例 1

```
2
```

輸入範例 2

```
5 16
6 1 8 2
2 5 3 6
6 3 10 8
3 6 5 7
1 3 1 6
```

輸出範例 2

```
23
```

範例說明

在範例 1 中，我們可以選擇左下角在 $(1,2)$、右上角在 $(3,5)$ 的長方形讓小明探索，如此就能完整的搜尋完可疑區域 1 和 3，因為長方形的面積是 12，效益值即為 $2\times 7-12=2$。

在範例 2 中，我們可以選擇左下角在 $(1,3)$、右上角在 $(5,7)$ 的長方形讓小明探索，如此就能完整的搜尋完可疑區域 2、4 和 5，因為長方形的面積是 25，效益值即為 $3\times 16-25=23$。

5_Benefit Evaluation

(15 points)

Time Limit: 1 second
Memory Limit: 256 MB

Statement

As an adventurer, Xiao Ming enjoys the process of exploration and the rewards he can gain from it. Today, he arrives at a vast land filled with treasures. This land can be viewed as a $10^4 \times 10^4$ grid. Through the analysis by his partner Xiao Yi, there are N suspicious regions on this land. Each suspicious region forms a rectangle. For each suspicious region, if Xiao Ming can search through it from start to finish, he will obtain treasures worth C.

However, Xiao Ming is a simple person, and asking him to search each suspicious region separately is too complex. Therefore, Xiao Yi decides to assign a **single rectangle region** for Xiao Ming to focus on. However, if the selected region is too large, it will cause Xiao Ming to work excessively. Thus, Xiao Yi hopes to select a region that is not too large.

Therefore, Xiao Yi seeks the help of an algorithm expert like you. Can you evaluate the best rectangle region for him? The evaluation is based on the following formula: "The number of suspicious regions completely contained within the selected rectangle multiplied by C", minus "the area of the selected rectangle." The goal is to maximize this evaluation value. Note that not selecting any rectangle is also an option, resulting in an evaluation value of 0.

Input Format

The first line contains two positive integers N and C, representing the total number of suspicious regions and the value Xiao Ming obtains after fully searching a region, respectively.

Next, there are N lines, each containing four positive integers d_i, l_i, u_i, r_i. These integers represent the bottom-left coordinates (d_i, l_i) and top-right coordinates (u_i, r_i) of the i-th suspicious region forming a rectangle.

Output Format

Output the maximum evaluation value under the best selection.

Constraints

- $1 \leq N \leq 100$
- $1 \leq C \leq 10^7$
- $1 \leq d_i \leq u_i \leq 10^4$
- $1 \leq l_i \leq r_i \leq 10^4$

Test Cases

Input 1

```
3 7
1 2 3 3
4 1 5 3
1 4 3 5
```

Output 1

```
2
```

Input 2

```
5 16
6 1 8 2
6 3 10 8
3 6 5 7
2 5 3 6
1 3 1 6
```

Output 2

```
23
```

Illustrations

In Example 1, we can select a rectangle with the bottom-left corner at $(1, 2)$ and the top-right corner at $(3, 5)$ for Xiao Ming to search. This will allow him to fully search suspicious regions 1 and 3. The area of the rectangle is 12, and the evaluation value is $2 \times 7 - 12 = 2$.

In Example 2, we can select a rectangle with the bottom-left corner at $(1, 3)$ and the top-right corner at $(5, 7)$ for Xiao Ming to search. This will allow him to fully search suspicious regions 2, 4, and 5. The area of the rectangle is 25, and the evaluation value is $3 \times 16 - 25 = 23$.