EJOI 2025 Day 1
Task Grid
🌐 **English**

European Junior Olympiad
in Informatics 2025
Shumen, Bulgaria | 29 August – 04 September

Task Grid

⏳ 0.3 sec.   💾 256 MB

Simona dreams of uncountable riches. She is offered to play a game for a big prize.

Simona will be placed in cell $(0,0)$ of a grid A of size $N \times M$ filled with positive integers. She must reach cell $(N-1, M-1)$. To do this, she is allowed to repeatedly move from her current cell (x, y) to any other cell $(x+d, y)$ or $(x, y+d)$, such that $d > 0$. For each such move, Simona will receive reward coins $|A_{x,y} - A_{x',y'}| - C$, where x', y' are her new coordinates and C is a constant cost fixed before the start of the journey. Note that if the expression $|A_{x,y} - A_{x',y'}| - C$ evaluates to a negative number, Simona will lose coins. Note also that it is possible to end the game with a negative number of coins.

Help Simona determine the maximum number of coins she can finish the game with.

Note that $|a| = a$ if $a \geq 0$ and $|a| = -a$, otherwise.

🦁 Implementation details

You have to implement the function `max_profit`:

```
long long max_profit(int N, int M, int C,
                     std::vector<std::vector<int>> A)
```

- N, M: the dimensions of the grid;
- C: the fixed cost constant for the test;
- A: vector of vectors of integers of size $N \times M$, representing the two dimensional grid (indexed by row and then column).

This function will be called once for each test and has to return the maximum number of coins Simona can end the game with.

🦁 Constraints

- $1 \leq N, M$
- $N \cdot M \leq 500\,000$
- $1 \leq A_{i,j} \leq 1\,000\,000$ for $0 \leq i < N$ and $0 \leq j < M$
- $0 \leq C \leq 1\,000\,000$

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🦁 Subtasks

Subtask	Points	Required subtasks	Additional constraints
0	0	—	The example.
1	9	—	$N = 1, M \leq 200$
2	5	—	$N = 1, A_{i,j} \leq A_{i,j+1}$
3	8	—	$N = 1, C = 0$
4	10	1	$N = 1, M \leq 50\,000$
5	7	$1 - 4$	$N = 1$
6	15	1	$N, M \leq 200$
7	9	2	$A_{i,j} \leq A_{i+1,j}, A_{i,j+1}$
8	12	3	$C = 0$
9	12	$0 - 1, 4, 6$	$N \cdot M \leq 50\,000$
10	13	$0 - 9$	—

🦁 Example

Consider the following call:

```
max_profit(5, 6, 4, {{20, 24, 31, 33, 36, 40},
                     {25, 23, 25, 31, 32, 39},
                     {31, 26, 21, 24, 31, 35},
                     {32, 28, 25, 21, 26, 28},
                     {36, 35, 28, 24, 21, 27}})
```

In this case the optimal path is $(0,0) \xrightarrow{7} (0,2) \xrightarrow{2} (1,2) \xrightarrow{10} (1,5) \xrightarrow{8} (4,5)$ and the number of coins achieved by following it is $7 + 2 + 10 + 8 = 27$. Your function must return 27.

```
max_profit(2, 2, 100, {{1, 2}, {3, 4}})
```

Here your function must return: -197. Note that the answer may be negative value.

🦁 Sample grader

The input format is the following:
- line 1: three integers – the values of N, M and C.
- lines $2 - (N+1)$: M integers – the values of $A_{i,j}$.

The output format is the following:
- line 1: one integer – the return value of the call.