IOI Training Camp 2013 – Final 3

1 Meeting Point, Again!

Hyperland is a K-dimensional city. There are N people located at grid points in this city—that is, points described by K integer coordinates.

These N people would like to meet. The meeting place should be a grid point such that the sum of the Manhattan distances from their initial locations to the meeting point is minimized. Recall that the Manhattan distance between two K-dimensional points $(x_1, x_2, \ldots, x_K)$ and $(y_1, y_2, \ldots, y_K)$ is $|x_1 - y_1| + |x_2 - y_2| + \cdots + |x_K - y_K|$.

Your task is to compute the number of candidate locations where they can choose to meet. Since the answer may be large, output the value modulo 1,000,000,007.

Note: It is possible that multiple people are at the same point initially.

Input format

- The first line consists of two space separated integers, N and K.
- The next N lines each consist of K space separated integers. Each line describe the coordinates of the initial location of one person.

Output format

A single integer, the number of points they can choose to meet at. Remember to output your answer modulo 1,000,000,007.

Test Data

- Subtask 1 (10 marks) : $N \leq 100$, $K \leq 2$, and for each initial location (x_1, x_2), $0 \leq x_1, x_2 \leq 500$.
- Subtask 2 (30 marks) : $N \leq 1000$, $K \leq 3$, and for each initial location (x_1, x_2, x_3), $0 \leq x_i \leq 5000$ for each coordinate x_i.
- Subtask 3 (60 marks) : $N \leq 10^5$, $K \leq 3$, and for each initial location (x_1, x_2, x_3), $|x_i| \leq 10^{18}$ for each coordinate x_i.

Sample Input

```
4 2
0 0
3 3
2 1
1 2
```

Sample output

```
4
```

Explanation

(1,1), (1,2), (2,1) and (2,2) are candidate points, each amounting to a total distance of 8.

Limits

- *Time limit:* 4 s
- *Memory limit:* 128 MB