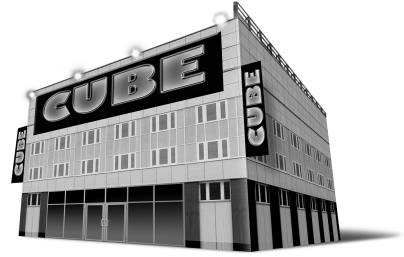


Problem E. In the cube

Input file: `input.txt`
Output file: `output.txt`
Time limit: 3 seconds
Memory limit: 256 MiB



Taja likes to go to the cafe «In the cube» with her friends, since it has very convenient ordering system. To make an order, guest should walk to the automated stand and choose any dishes they likes. There are several such stands and they all are fixed at specific place inside the cafe.

In the cafe guests sit in front of tables, there are k tables. i th table cannot serve more than c_i persons. Uncomfortableness of the table position is the sum of the distances from this table to c_i automated stands closest to it.

Formally, cafe is the grid $(0, 0) - (5000, 5000)$. Each cell (x, y) ($0 \leq x, y \leq 5000$) can contain either single automated stand or single table or nothing.

The distance between cells (x_1, y_1) and (x_2, y_2) equals to $|x_2 - x_1| + |y_2 - y_1|$.

You are to arrange the tables in such a way, that total sum of uncomfortablenesses for all tables should be minimal.

Input

First line of the input contains two integers n and k ($1 \leq n \leq 18$, $1 \leq k \leq 200$) — amount of automated stands and tables correspondingly.

Following n lines contain coordinates of i th stand: two integers x_i and y_i ($0 \leq x_i, y_i \leq 5000$).

Next of each k lines contain single integer c_j ($1 \leq c_j \leq n$) — number of seats at j th table.

Output

Output should contain single integer — minimal total uncomfortableness.

Examples

input.txt	output.txt
3 4 1 2 4 1 5 4 1 2 3 3	20
2 10 0 0 5000 5000 1 1 1 1 1 1 1 1 1 1 1	16

Explanation

Possible arrangement of the tables for the first sample looks like this:

