Problem B: A Pedestrian Problem

pedestrian – *adj.* lacking
inspiration or excitement; dull

The English Dictionary

Traffic lights are placed on the crossing points of roads, and their purpose is to orchestrate the traffic so that people safely pass to the other side. A pedestrian crosses the road only when the traffic lights are green, and a smart pedestrian would try to plan his/her crossings to make the best use of the times when the green lights are switched on. Our city, as shown in the picture, is modeled as a grid of n rows and m columns, and there are houses located between these. Namely, our convention is that the square-shaped space between the intersections of the i-th row and j-th column, and that of the $(i+1)$-th row and $(j+1)$-th column, is occupied by a block of flats. The pedestrian tries to get from the upper-right-corner of the lower-left block of flats to the lower-left corner of the upper-right block of flats. Your task is to help him/her to reach the destination in the fastest possible way. It takes the pedestrian exactly 1 minute to cross a street, but that is only if the green light is switched on during the entire passing. The pedestrian can also move parallel to a road (i.e. along the edge of a house) ;it takes exactly 2 minutes. However, even if it is allowed to move by the edges of the road, the footer abides by the rules, that is why, he/she is not able to pass 2 opposite corners of the crossing of the highways diagonally.

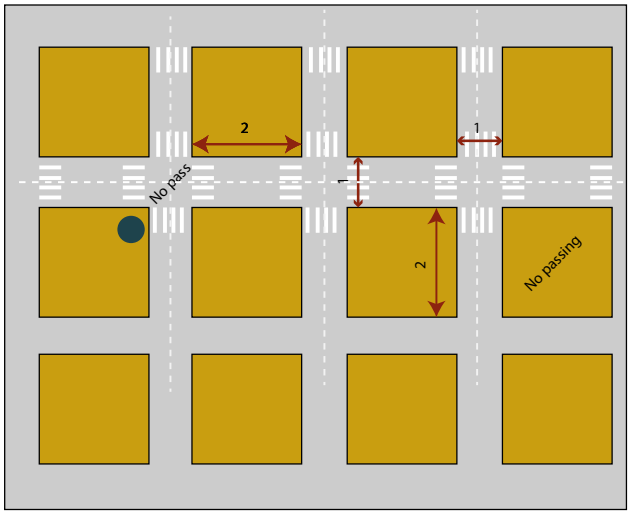

Figure 1: City grid.

The system of lights work by the following algorithm. At the i-ths intersection, the up-to-down lights remain green for S_i minutes; during this period, the left-to-right lights show red. Next, the up-to-down lights start showing red, while the left-to-right lights become green. They remain green for W_i minutes. Then the same cycle repeats. The pedestrian's movement starts at the instant marked by $t = 0$ minutes; traffic light i's cycle starts by becoming green in the up-to-down direction at the instant of $t = T_i$ minutes. You can assume that the cycle has actually started long time ago, i.e. before $t = T_i$.

For example, the 0-th intersection could be in the following configuration:

$$S_0 = 3, W_0 = 2, T_0 = 0$$

The up-to-down road's traffic light becomes green after 0 minutes and stays so for 3 minutes. During these 3 minutes, the pedestrian is free to traverse the road from up to down, but not from the left-right direction. Next, the lights flip their state. That means, during the next 2 minutes, the pedestrian is free to traverse in the left-right road but not the vertical road.. Finally, after 5 minutes, the cycle re-launches. Notice the equivalence of this scenario to the following setup:

$$S_0 = 3, W_0 = 2, T_0 = 10$$

Input

The input starts with the number of test cases, C, which is followed by C cases, given in the format that follows. Each test case consists of a line with two non-negative integers n m – with n being the number of rows (i.e. left-to-right roads), and m being the number of columns (i.e. top-to-bottom roads). The follow n lines, the i^{th} line being the information about the i^{th} row (where 0^{th} row is the upper-most), in the following format: there are exactly $3m$ non-negative integers $S_{i,0}\, W_{i,0}\, T_{i,0}\, S_{i,1}\, W_{i,1}\, T_{i,1} \ldots S_{i,m-1}\, W_{i,m-1}\, T_{i,m-1}$, with $S_{i,j}, W_{i,j}$ and $T_{i,j}$ referring to the juncture of the row number i (counted from the upper-most, starting from 0), and the column number j (counted from the left-most, starting from 0).

You can assume that $1 \leq m, n \leq 20$, $0 < S_{i,j}, W_{i,j} \leq 10^7$, $0 \leq T_{i,j} \leq 10^8$.

Output

The output for each test case is a line containing `Case x: t`, where x is the number of the test case (starting with 1), and t is the answer to the problem – the fewest number of minutes it takes for the pedestrian to reach his/her destination.

Sample Input	*Sample Output*
3 1 1 1 1 0 3 3 1 1 0 1 1 0 1 1 0 1 1 0 1 1 0 1 1 0 1 1 0 1 1 0 1 1 0 2 2 1 1 0 10 1 6 10 1 0 1 10 10	Case 1: 2 Case 2: 14 Case 3: 12