TASK: optimal_placement

REV: January 06, 2024

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|STATEMENT|

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There exists a grid of size N by N. You are given M flags to place on the grid, numbered from 1 to M. A flag numbered i can be placed either on (x_i, y_i) or (w_i, z_i). After you place all the flags on the grid, the "covering score" of the grid is defined as the minimum of distance between any two distinct flags.

The distance between flag positioned at (x, y) and (x2, y2) is defined as |x - x2| + |y - y2|. Note that |v| means the absolute value of v.

We call a placement of flags "optimal" if there is no placement with greater "covering score".

Your task is to find any optimal placement.

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|CONSTRAINTS|

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N and M are positive integers not exceeding 2000 and 500 respectively.

M is more than one

N * N >= 2 * M

x_i, y_i, w_i, z_i are integer not less than 1 and not more than N

(x_i, y_i) != (w_j, z_j) for all i, j

(x_i, y_i) != (x_j, y_j) for all i, j

(w_i, z_i) != (w_j, z_j) for all i, j

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|INPUT|

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The first line consist of two integers: N M

The following M lines consist of four integers.

Where i-th line is made of x_i, y_i, w_i, z_i.

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|OUTPUT|

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In the first line, print the covering score of the optimal placement found.

In the second, print a string of length M to report which option was selected for each flag.

That is in for each flag, print "A" if i-th flag was placed at (x_i, y_i) and "B" if i-th flag was placed at (w_i, z_i).

Please do not use whitespace to seperate the option each flags.

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|SAMPLE|

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input#1:

3 2

2 3 2 1

3 1 1 1

output#1:

3

AB

note:

in the above sample, AA would also be a valid answer

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