Resting residence (pentagon)

The year is 3013. Since all the ice on the Earth has melted, Bosnia and Herzegovina is underwater. The life is moved onto platforms, that have the shape of simple pentagons (pentagons with five equal sides). Every pentagon has at most 5 neighbouring pentagons, each of which is close to one of its sides. Don’t struggle with geometry here – everything is in the future and every placement of the pentagons is possible. Every pentagon has one or more half-bridges, that point to some of neighbouring pentagons. Half-bridges are used to go from one pentagon to a neighbouring one. But for that to happen, the neighbouring pentagon must also have a half-bridge pointing to the initial pentagon.

Even though it is possible that there is no half-bridge pointing to every neighbor, moving can still be done, since pentagons can be rotated clockwise. When a pentagon is rotated clockwise, every half-bridge rotates along with him. In result of rotating, the half-bridge points to the next neighbor in clockwise order, or to the water if there is no such neighbor. Pentagons have starting position and are rotating when needed. Five consecutive rotations clockwise of the same pentagon put him in his initial position. There are total of N pentagons numbered from 1 to N .

The rotating of a pentagon is energy-consuming operation, and so is the moving through the bridges. Therefor, they are rotated only then the President wants to reach his resting residence located on the pentagon with number N. The president always starts from his office, that is located in the pentagon with number 1.

After long experiments, Bosnian scientist managed to reduce the used energy in such a way, that it is required the same amount of energy for each of the following three actions:

1. Single rotation of some pentagon clockwise
2. Moving the president’s vehicle through a bridge (it is required that the pentagons between he moves, have half-pointing bridges pointing to each other)
3. Single rotation of some pentagon clockwise followed by moving through some bridge.

It is impossible to do two consecutive rotations, two consecutive moving or a moving followed by a rotation using only one unit of energy.

Pentagons remain rotated, while the presidents is moving through them and immediately after he leaves some pentagon, it returns in its initial position.

Task

Your task is to create a function MinimalSteps, that takes two parameters. The first is an integer number N – the amount of pentagons. And the second is a matrix P:

$$\begin{pmatrix} p_{0,0} & p_{0,1} & p_{0,2} & p_{0,3} & p_{0,4} \\ p_{1,0} & p_{1,1} & p_{1,2} & p_{1,3} & p_{1,4} \\ \vdots & \vdots & \vdots & \vdots & \vdots \\ p_{i,0} & p_{i,1} & p_{i,2} & p_{i,3} & p_{i,4} \\ \vdots & \vdots & \vdots & \vdots & \vdots \\ p_{n-1,0} & p_{n-1,1} & p_{n-1,2} & p_{n-1,3} & p_{n-1,4} \end{pmatrix}$$

Where every row i, (0<=i<N) describes the order of the five sides clockwise j, (0<=j<5) of the pentagon i+1, with the following interpretation:

- If the pentagon i+1 doesn’t have a neighbour, nor half-bridge on side j, then p_{ij}=0;
- If the pentagon i+1 doesn’t have a neighbour, but has a half-bridge on side j, then p_{ij}=10000;
- If the pentagon i+1 has a neighbour k on side j, but doesn’t have a half-bridge pointing to k, then p_{ij}=k
- If the pentagon i+1 has a neighbour k on side j, and has a half-bridge pointing to k, then p_{ij}=10000+k

The function returns the minimum amount of energy units used, for the President to reach his deserved rest, moving from pentagon 1 to pentagon N. If it is impossible for the President to reach his resting residence, then the function should return -1 (negative energy).

Example

$$MinimalSteps\left(4, \begin{pmatrix} 10000 & 0 & 2 & 0 & 0 \\ 10003 & 10001 & 0 & 0 & 0 \\ 4 & 0 & 10000 & 2 & 0 \\ 10000 & 10000 & 10003 & 10000 & 10000 \end{pmatrix}\right)$$

Here is how it is possible to reach pentagon N from pentagon 1 using 5 units of energy.

1. Rotating pentagon 1;
2. Rotating pentagon 1 and moving to pentagon 2
3. Rotating pentagon 3 and moving to pentagon 3
4. Rotating pentagon 3
5. Rotating pentagon 3 and moving to pentagon 4

It is impossible to reach the residence using less than 5 units of energy.

Subtasks

Subtask 1 (14 points): N<=100, there is a half-bridge on every side of every pentagon

Subtask 2 (17 points): N<=100, every pentagon has exactly two neighbours, except pentagons 1 and N, that have only one neighbour.

Subtask 3 (12 points): N<=10

Subtask 4 (23 points): N<=400

Subtask 5 (34 points): N<=5000