

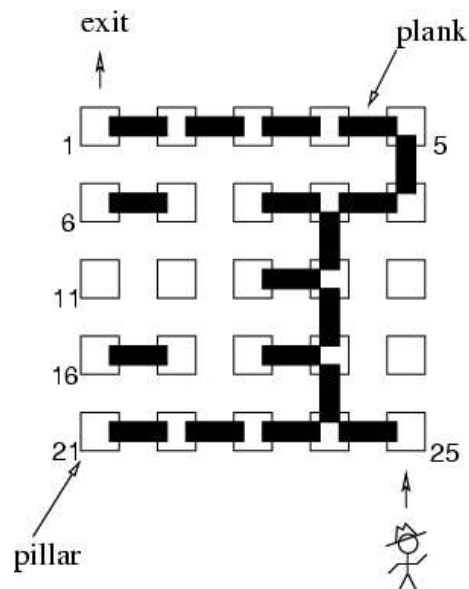
7th South African Regional ACM Collegiate Programming Competition

Sponsored by IBM

Problem E – Orange balloon Snake pit

Your favourite adventurer, Dr. Jones, happens to find himself in a bit of a tight spot (again). He has just liberated the sacred artifact from the temple of Doomtm III, and the natives, being in a bad mood already, are in hot pursuit.

Now he faces a maze, resembling something like the diagram below:



The maze consists of a square grid of pillars standing in a pit, with the distance between the pillars just exceeding the distance that Jones can safely jump across. Some of the gaps between the pillars are bridged with planks, so (in theory) it would be reasonably safe to cross. Falling down is not an option: the bottom of the pit is crawling with snakes.

The natives are closing in quickly (having spotted the pirated copy of the sacred artifact that Jones swapped out with the original much sooner than he had hoped), so Jones must cross the maze as quickly as possible.

Fortunately, Dr. Jones is in possession of a suitable plank that can be used to bridge one of the gaps between two of the pillars. He only has enough time to use it once, *i.e.* there is no time to pick it up and re-use it elsewhere.

It is up to you to calculate the shortest possible path through the maze, or Jones will face the same fate as those pesky marines.

Input

Your input consists of an arbitrary number of records, each record conforming to the following format:

```
<grid_size>
<bridge_1_endpoint_1> <bridge_1_endpoint_2>
<bridge_2_endpoint_1> <bridge_2_endpoint_2>
...
<bridge_n_endpoint_1> <bridge_n_endpoint_2>
-1
```

The value `<grid_size>` represents the number of pillars in a row (and column).

The subsequent lines indicate the starting- and end-pillar number of each bridging plank. Pillars are numbered by row, starting from 1, as indicated in the diagram above. The pair of numbers 2 3 therefore indicate the presence of a plank (bridge) between pillars 2 and 3. You must calculate the shortest path from node 1 to node `<grid_size> * <grid_size>`. You can bridge one additional gap (only North-South or East-West, like the existing bridges) with the plank that Jones is carrying with him.

Output

For each input record, your output should be the number of bridges that Jones used in his shortest path from the entrance to the exit of the maze.

Sample Input

```
4
1 2
2 3
3 4
4 8
7 8
9 10
10 11
7 11
11 15
13 14
14 15
15 16
-1
```

Sample Output

```
6
```