32nd Annual

Rowan University Programming Contest

hosted by the

Computer Science Department

Friday, 27 April 2018

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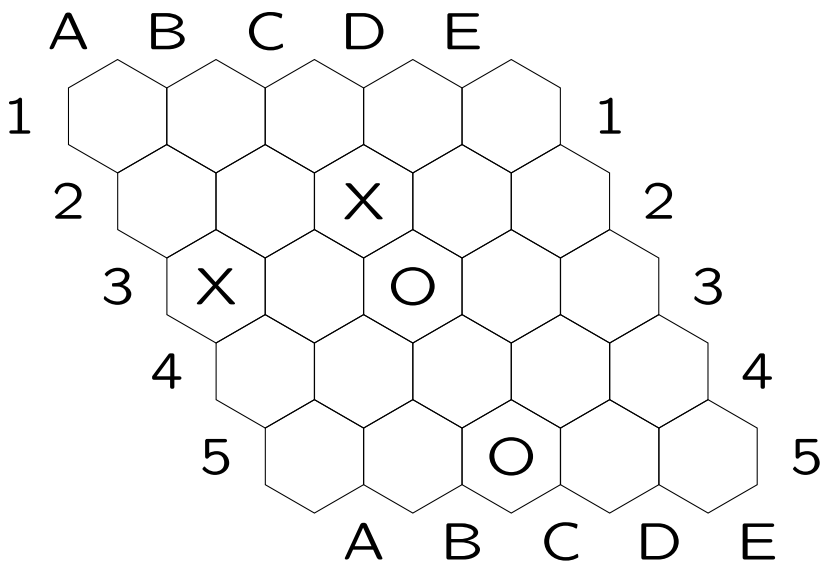
Hex

The game ‘Hex’

Hex is a game played on a group of hexagons in a rhomboid:

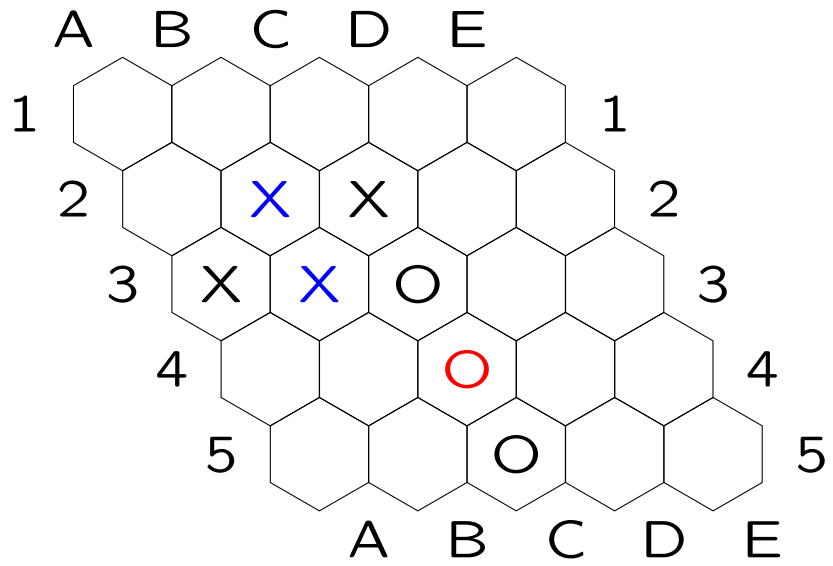


X tries to complete a path from left to right, while O tries to complete a path from top to bottom.

In the game as shown at left, player X has marked positions A3 and C2, while player O has marked positions C3 and C5.

Strategy Note

Having more paths is better.



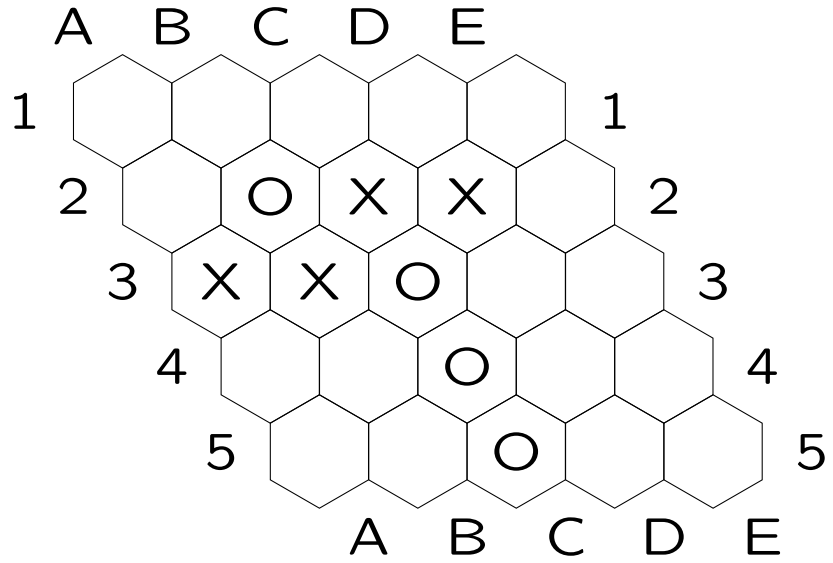
X has two ways to connect his pieces in columns A and C in a single turn, both marked here in blue.

O has only one way to connect his pieces in rows 3 and 5 in a single turn, marked here in red.

If X blocks at C4, O has to go around to connect from row 3 to row 5. Whether O blocks at B2 or B3, X can still connect from column A to column C in one turn.

Strategy Note

Having shorter paths to completion is better.



X has made four moves, and can win in one more turn.

O has made four moves, but needs at least three turns to win.

Note also that X has two ways to win in one turn; O cannot block both of them in one turn.

O, however, has only one way to win in three turns, and can easily be blocked.

Simplifications

For a computer to play well at a game such as *Hex*, it has to be able to tell how good a board layout is, which might involve considering how many paths to victory there are, how easily blocked the opponent's pieces are, and other such questions.

For this problem, we will focus only on one question: 'What's the minimum number of spots needed to win?'

The board will always have the same number of rows and columns.

The board size is limited to the range 1x1 through 21x21, inclusive.

Write a program which reads in a grid, which spots are already claimed by one or the other player, and reports whether the game is already over (having been won). If the game is not over, report the minimum number of spots needed for X or O to win.