

355 fall 2022 assignment 7

For this assignment, post **CLARIFYING QUESTIONS ONLY** on eclass. Posting suggestions or your answers or hints on eclass or any other site – e.g. a discord server or anywhere else – is plagiarism.

You can work on this assignment in groups of up to 5: within your group, you can discuss any questions, but you cannot copy answers. Each student must submit their own assignment. Discussing or copying with any student outside your group is plagiarism.

We might ask you later to explain your answers: if you are unable to do so, we might deduct some or all marks and report this to the faculty of science.

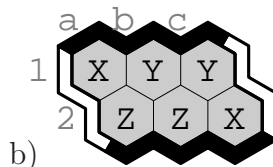
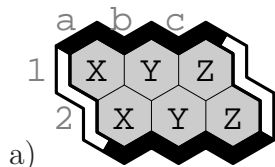
For this assignment, each student's secret number is the 4th and 5th integer of their student id, interpreted as a 2-digit number. E.g. if your id is *****91****, then your secret number is 91. Some questions ask you for m , your secret number mod 3. E.g. if your secret number is 91, your m is 1.

Submit each answer on eclass.

1. **If you do not answer this question we will not mark the assignment and your assignment score will be 0.**
 - (a) In your own words, state that you accept the plagiarism policy above.
 - (b) Give the names and ccids of all members of your discussion group (including yourself). Explain how you worked together: e.g. discussed every question, discussed only questions 1 and 3 with group members X and Z, etc.

2. Consider Hex on the 2×3 board with White playing first. Which of the following pairing strategies, if any, gives a winning 2nd-player strategy for Black? If the strategy **is** winning, give all 8 possible final board positions after Black and White play. If the strategy **is not** winning, give a winning sequence of play for White.

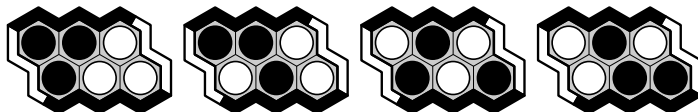
Example question:



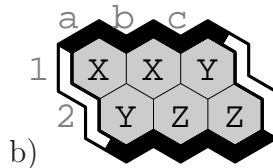
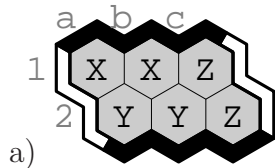
Example answer:

a) is not winning. 1.W[a1] 2.B[a2] 3.W[b1] 4.B[b2] 5.W[c1] 6.B[c2] wins for White.

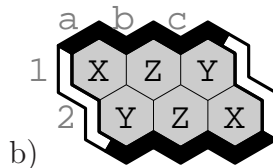
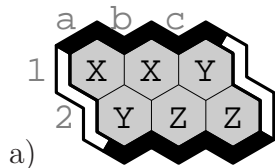
b) is winning. Here are 4 of the 8 possible final game positions (I leave it to you to find the remaining 4). In each of the 8 cases, Black wins.



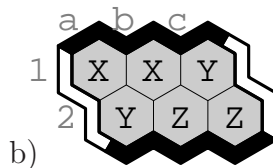
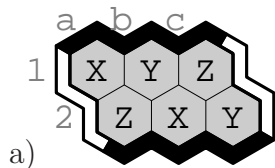
Your question if your m is 0:



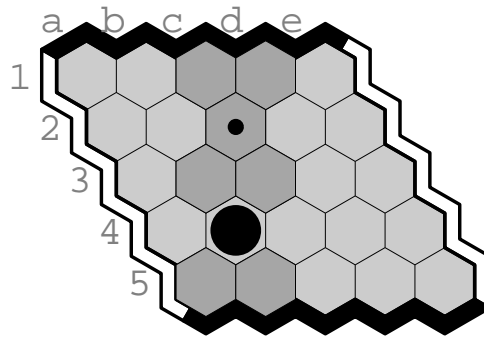
Your question if your m is 1:



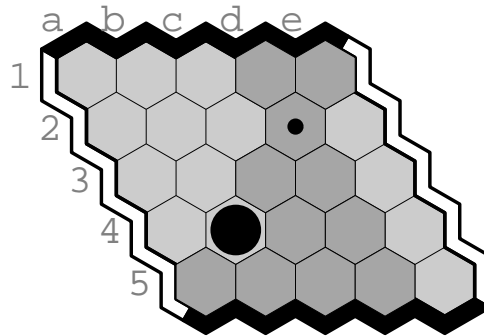
Your question if your m is 2:



3. Consider this Hex position with White to play. The shaded cells show a Black win-threat: if White does not interfere with this threat by playing at one of the 7 shaded cells, then Black can play at the dot and win with the 3 bridge connections bottom-b4, b4-c2, c2-top.



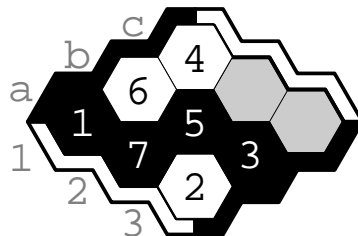
- a) Explain carefully why the following is also a Black win-threat.



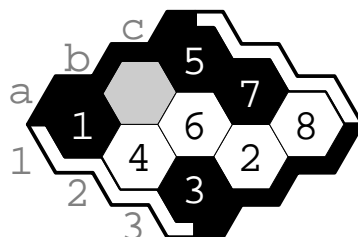
- b) If White does not want to lose to either of these two Black win-threats, where must White play on her next move? Explain briefly.

4. For each move in this game: is it a blunder? if yes, explain; if no, explain.

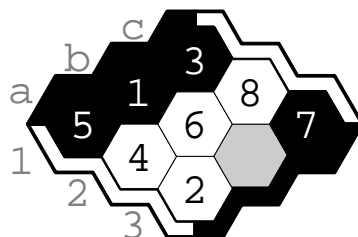
If your m is 0, use this game.



If your m is 1, use this game.



If your m is 2, use this game.



5. Continue this class MCTS example:

<http://webdocs.cs.ualberta.ca/~hayward/355/mcts.pdf> .

a) show the tree after iteration 5, assuming that the simulation was a win for Black.

b) assume that the search ends after 5 iterations; use `approx-ratio` to pick the move that MCTS recommends; show your work.

c) and d): repeat a) and b) assuming that the simulation was a win for White.

If your m is 0: within `{pick-best-child}`, break ties by preferring cells in this relative order: a1, a2, a3, b1, b2, b3, c1, c2, c3.

If your m is 1: within `{pick-best-child}`, break ties by preferring cells in this relative order: c3, c2, c1, b3, b2, b1, a3, a2, a1.

If your m is 2: within `{pick-best-child}`, break ties by preferring cells in this relative order: b2, b1, b3, a3, c1, a2, c2, a1, c3.