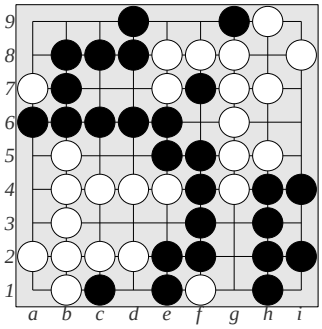
cmput 497/670 2024 homework 2

1. For a go position and a color, a *chain* (also called *solid block*) is a maximal connected set of stones of that color. Answer these questions for this position, from Figure 3.1 in *Mathematical Go: Chilling Gets the Last Point* by Berlekamp and Wolfe. (i) Give the number of black chains, white chains, black stones, white stones, black territory, white territory and the current score (e.g. Black by x or White by y or tied). (ii) Assume White now makes a non-pass move, and then both players pass. What is a best move for White? Explain briefly. (iii) From the position, assume White makes some number of non-pass moves and that Black passes after each and then White passes. What is the best score that White can achieve? Explain briefly.

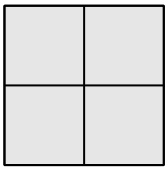


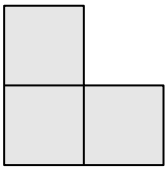
2. a) In your own words, explain what it means for two games to be equivalent (text, defn 2.9). b) Give an example of two domineering games with non-isomorphic game trees that are equivalent. c) What is the usual way to check whether games G and H are equivalent? Illustrate with your answer to b).

3. Recall that the game notation (left options, right options) for the game 2 is $\{1 \mid \}$. (a) Give the game notation for the game 1.

   (b) Recall that for impartial games, when we give the game notation, we give the game options only for one player, e.g. $\{*1, *0\}$ is the game notation for $*2$. Why do we do this? (c) Which of these are true? Explain. $*0 = 0$. $*1 = 1$. $*1 = *$. $*2 = 2$. $*2 = 2*$.

4. Below are two domineering games G (with 4 cells) and H (3 cells). For G and for H, draw the complete game tree: do not prune any options. Explain why G and H are both in the outcome class N. Find a game K such that G+K and H+K are in different outcome classes. Are G and H equivalent? Explain briefly.





5. chapter 2 (text p41 ff) Exercise 1
6. " Exercise 3
7. " Exercise 4
8. " Exercise 5
9. " Exercise 6
10. " Exercise 7
11. " Exercise 8
12. (a) In combinatorial game theory, what does the statment below mean? Explain completely.

    statement: $1 < 2$.

    (b) Prove the statement.

The following questions refer to the hackenbush article by Tom Davis.

13. Prove that the game at the top of page 3 is a P-position.
14. Prove that game B in section 7 satisfies the equation $B + B \equiv 1$
15. Prove that the game 1/2 (second line of diagram, start of section 12) is equivalent to the game B in the previous question.