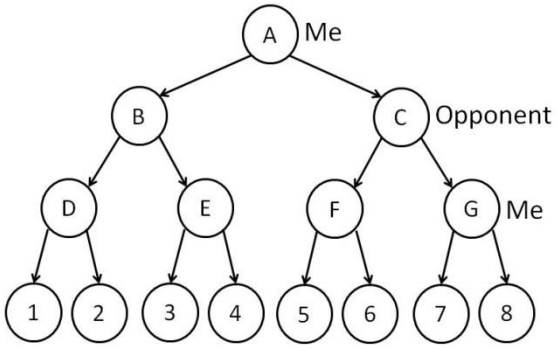
CS 4700, Foundations of Artificial Intelligence
Spring 2020
Solutions to Quiz 5

1. Consider the following game tree, which you can also find at https://www.cs.cornell.edu/courses/cs4700/2020sp/quizzes/MOM.JPG. What are the values of nodes A-G?



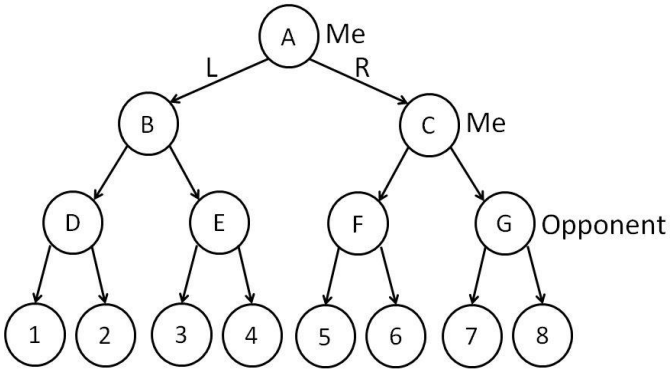

Let's work from bottom up:

D=2, E=4, F=6, G=8

B=2, C=6

G=6

2. There were two possible questions:
   - Consider the following game tree below, also available at https://www.cs.cornell.edu/courses/cs4700/2020sp/quizzes/MMO.JPG, that depicts a game where the players don't alternate turns but rather I make two consecutive moves and then my opponent makes one move.




Which move should I make (enter "L" or "R")?

R, because it results in 7. (L results in 3.)

What is the value of node A?

Let's work from bottom up:

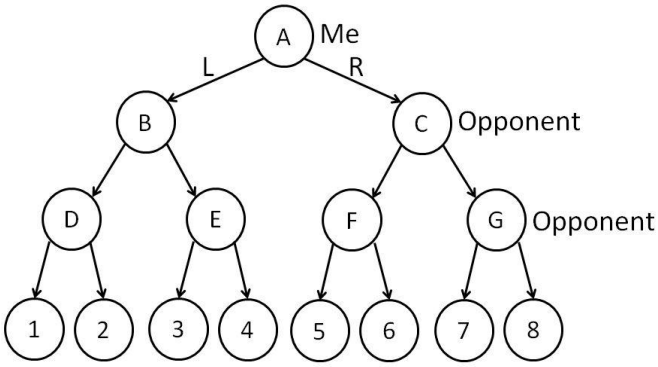
D=1, E=3, F=5, G=7

B=3, C=7

A=7

   - Consider the following game tree below, also available at https://www.cs.cornell.edu/courses/cs4700/2020sp/quizzes/MOO.JPG, that depicts a game

where the players don't alternate turns but rather I make one move and then my opponent makes two consecutive moves.




Which move should I make (enter "L" or "R")?

R, because it results in 5. (L would result in 1.)

What is the value of node A?

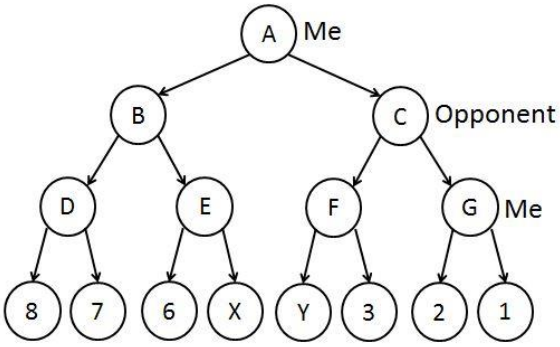
Let's work from bottom up:

D=1, E=3, F=5, G=7

B=1, C=5

A=5

3. There were two possible questions:
   - Consider the game tree shown below, which is also available at https://www.cs.cornell.edu/courses/cs4700/2020sp/quizzes/MOM1.JPG. The evaluation function for terminal nodes in this game always returns an integer in the range of 1 to 8 (inclusive).

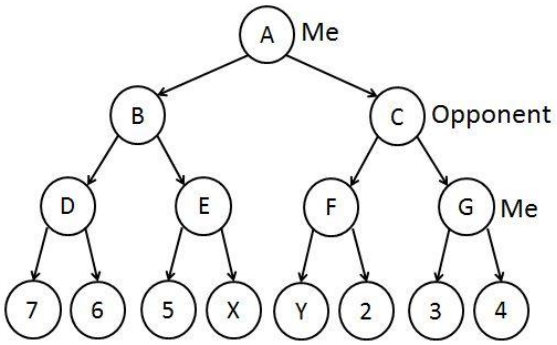



What value must Y be so that node G is pruned by alpha-beta pruning regardless of the value that X takes on?

G will get pruned if Y ≤ min(max(8,7),max(6,X)) = min(8,max(6,X)). If X is 6 or less this becomes min(8,6)=6; if X is 7 this becomes min(8,7)=7; if X is 8 this becomes min(8,8)=8. In other words, the only three values the left subtree of A can have are 6, 7, and 8. Pruning happens if Y is less than or equal to the value of the left subtree and any value for Y between 1 and 6 inclusive guarantees that for any value of X G gets pruned.

   - Consider the game tree shown below, which is also available at https://www.cs.cornell.edu/courses/cs4700/2020sp/quizzes/MOM2.JPG. The evaluation

function for terminal nodes in this game always returns an integer in the range of 1 to 8 (inclusive).




What value must Y be so that node G is guaranteed to NOT be pruned by alpha-beta pruning regardless of the value that X takes on?

G will not be pruned if Y > min(max(7,6),max(5,X)) = min(7,max(5,X)). If Y is 7 or less then pruning will happen if X is 7 or 8. The only value of Y for which no pruning happens for any value assigned to X is if Y is 8.