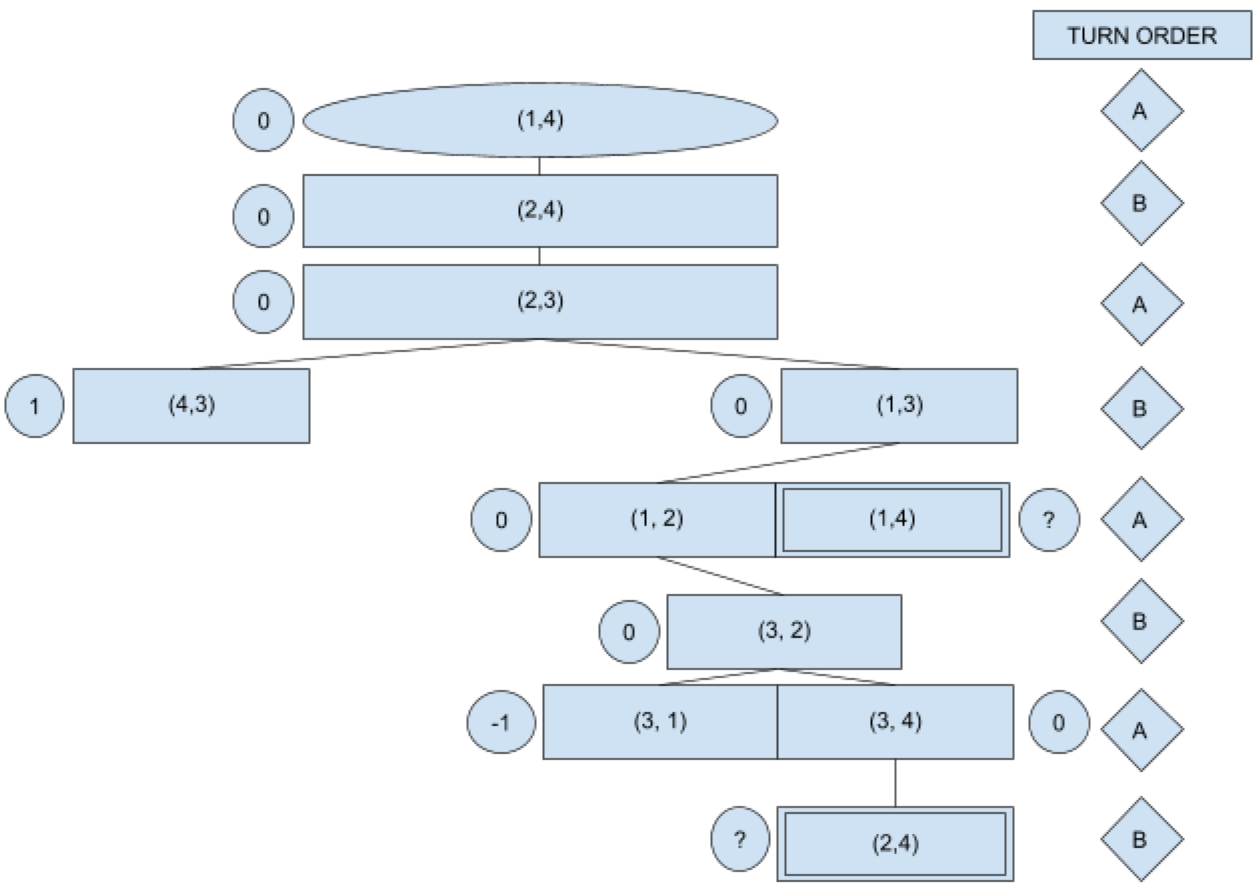
1. Consider the following two player game in its starting position:

A | | | B

1 2 3 4

Rules: Player A moves first. The two players take turns moving, and each player must move his token to an open adjacent space in either direction. If the opponent occupies an adjacent space, then a player may jump over the opponent to the next open space if any. (For example, if A is on 3 and B is on 2, then A may move back to 1.) The game ends when one player reaches the opposite end of the board. If player A reaches space 4 first, then the value of the game to A is +1; if player B reaches space 1 first, then the value of the game to A is -1.

Draw the complete game tree using the following conventions (30 pts)
Write each state as (SA,SB)(SA,SB), where SASA and SBSB denote token locations.
Put each terminal state in a square box and write its game value in a circle
Put loop states (states that already appear on the path to the root) in double square boxes.
Since this value is unclear, annotate each with a "?" in a circle.



Now, mark each node with its backed-up minimax value (in a circle). Explain how you handled the "?" values and why.(10pts)

The “?” values are handled as a 0 since none of them are end states. We would then loop if we see a “?” to its closest matching values.

Explain why the standard minimax algorithm would fail on this game tree (15pts)

That is because given the order of the sequence we notice A always has the first chance of winning the game. This is because of the limited field and the order in which players take turns. Therefore, the minimax algorithm would not work because it would always hit the min (B wins) first and never hit the max (A wins) given hitting the min.

2. **Which of the following are true and which are false? Give brief explanations**

In a fully observable, turn taking, zero sum game between two perfectly rational players, it does not help the first player to know what strategy the second player is using --that is, what move the second player will make, given the first player's move.(15 pts)

Since it is a fully observable, turn taking, zero sum game between two rational players, we know that both players will make their optimal move. Therefore, since both players are playing perfect the only option to win in a fair game would be a strategy that the opponent isn't expecting. A perfect example of this scenario would be chess where strategy is continually implemented to gain the upper hand. Therefore, the answer is false.

In a partially observable, turn taking, zero sum game between two perfectly rational players, it does not help the first player to know what move the second player will make, given the first player's move.(15 pts)

This answer is also false because both players are perfectly rational and will always move to gain the advantage, therefore strategy will always be involved. By knowing the other players strategy it will increase the odds of winning over the opponent.

A perfectly rational backgammon agent never loses.(15 pts)

Our scenario is false given the criteria because backgammon is based upon the roll of rolling dice and therefore random.