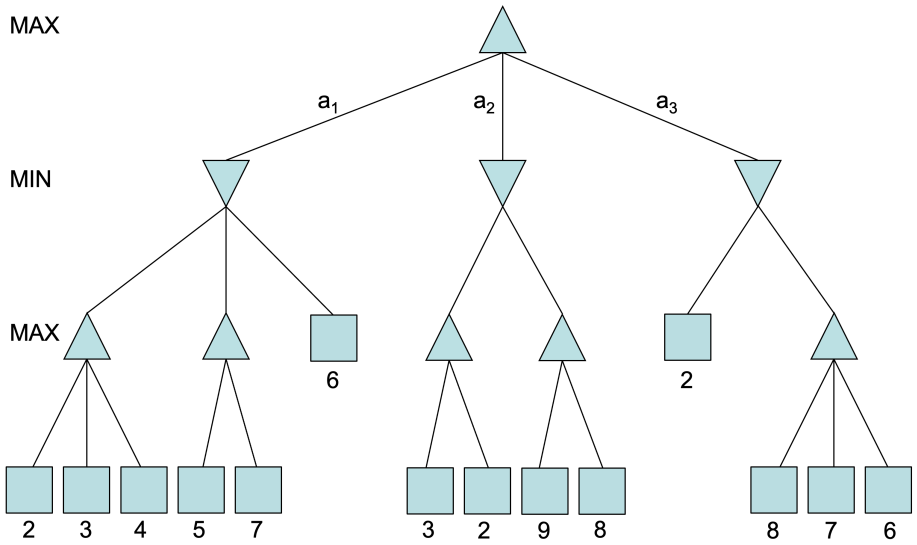
Washington State University
School of Electrical Engineering and Computer Science
Fall 2021

CptS 440/540 Artificial Intelligence
Homework 4 – Solution
Due: September 23, 2021 (11:59pm pacific time)

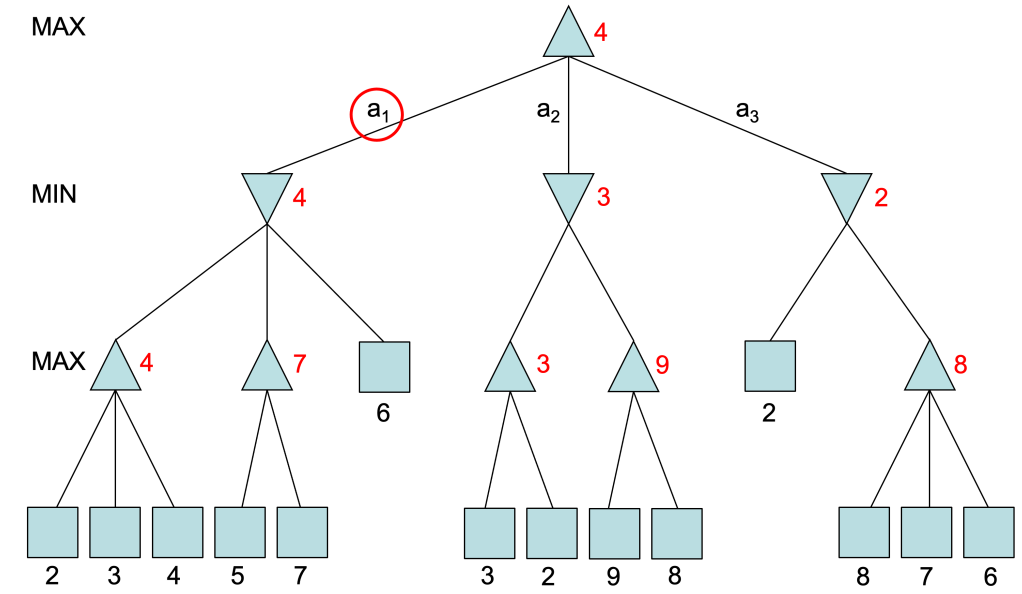
General Instructions: Put your answers to the following problems into a PDF document and upload the document as your submission for Homework 4 for the course CptS 440 Pullman (all sections of CptS 440 and 540 are merged under the CptS 440 Pullman section) on the Canvas system by the above deadline. Note that you may submit multiple times, but we will only grade the most recent entry submitted before the deadline.

1. Consider the game tree below. Upward-pointing triangles are MAX nodes, downward-pointing triangles are MIN nodes, and squares are terminal nodes.
   a. Show the result of performing Minimax-Decision search on the game tree. Put the final value next to each node in the tree. Finally, indicate which action MAX should take: a_1, a_2 or a_3.
   b. Show the result after performing Alpha-Beta-Search on the game tree (don't reuse your tree from part (a)). Put an "X" over all nodes (internal and terminal, and all nodes in a subtree) that are pruned, i.e., not evaluated. Put the final value next to all non-pruned nodes. Finally, indicate which action MAX should take: a_1, a_2 or a_3.

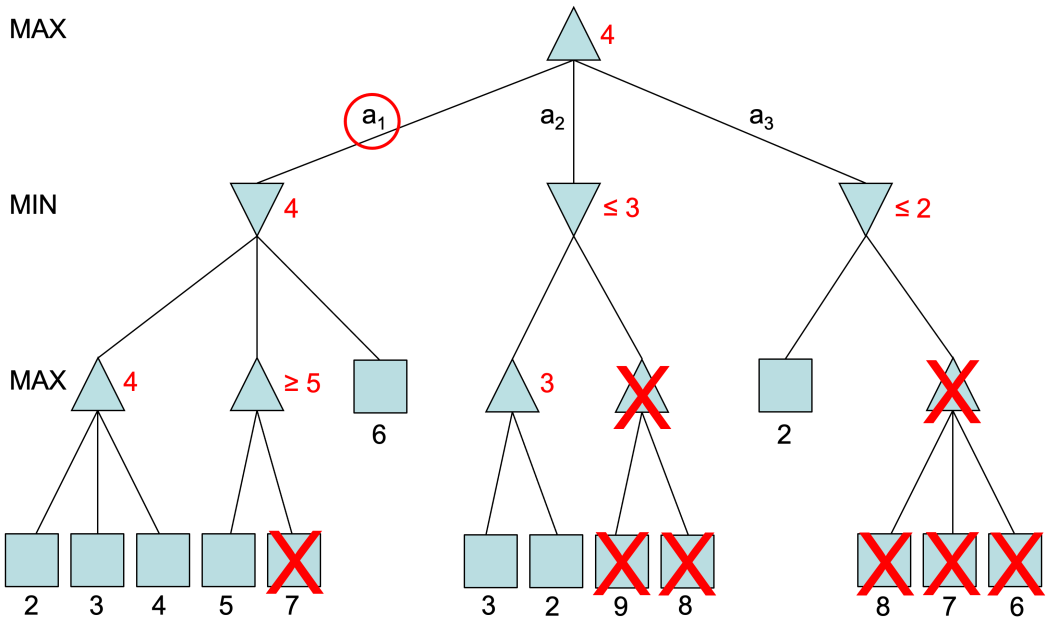


Solution:

a. Minimax-Decision



b. Alpha-Beta-Search



2. *CptS 540 Students Only*: For the level 2 terminal node (with value 2) in the a_3 subtree of the game tree in Problem 1, how would you change this value in order to ensure a_3 is the optimal choice for MAX?

   Solution: Setting this node's value > 4 will make a_3 the optimal choice for MAX.