IAIP Exercises Week 3

1. (*) (exercise 8.1, Nils J. Nilsson, Artificial Intelligence: A New Synthesis, Morgan Kaufmann, 1998). In the water-jug puzzle, we are given a 3-liter jug, named *Three*, and a 4-liter jug , named *Four*. Initially, *Three* and *Four* are empty. Either jug can be filled with water from a tap, *T*, and we can discard water from either jug down a drain, *D*. Water may be poured from one jug into the other. There is no additional measuring device. We want to find a set of operations that will leave precisely two liters of water in *Four*. [Don't worry! Here's a solution: (a) fill *Three* from the tap, (b) pour *Three* into *Four*, (c) fill *Three* from the tap, (d) pour as much from *Three* into *Four* as will fill it, (e) discard *Four*, (f) pour *Three* into *Four*.]

    1. Set up a state-space search formulation of the water-jug puzzle:
        a) Give the initial iconic state description as a data structure.
        b) Give a goal condition on states as some test on data structures.
        c) Name the operators on states and give precise descriptions of what each operator does to a state description

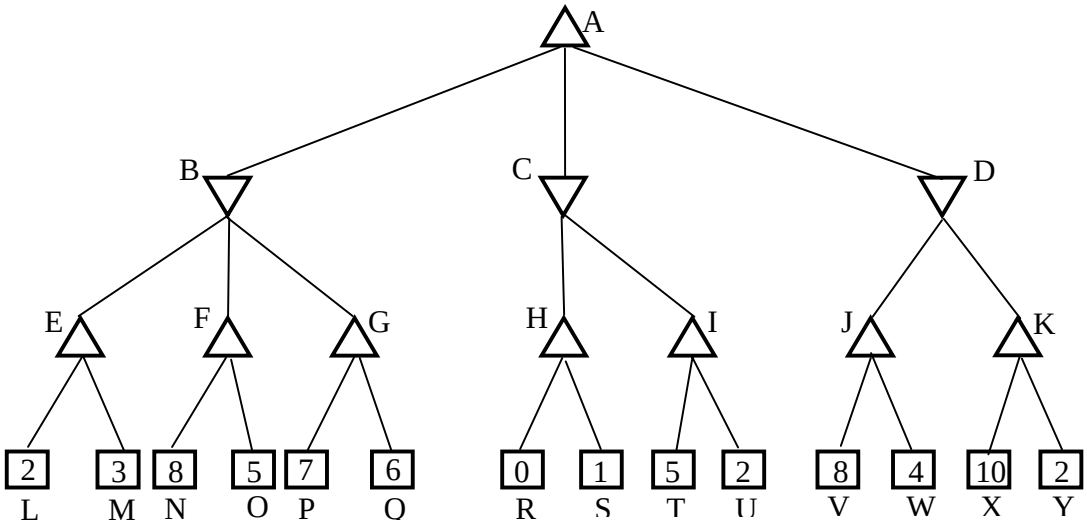
    2. Draw a graph of all of the *distinct* state-space nodes that are within three moves of the start node, label each node by its state description, and show at least one path to each node in the graph - labeling each arc by the name of the appropriate operator. In addition to these nodes, show also all of the nodes and arcs (properly labeled) on a path to the solution.

2. Russell and Norvig p.90: 3.8

3. (*) Russell and Norvig p.91: 3.13

4. Russell and Norvig p.93: 3.17

5. (*) (exercise 12.2, Nils J. Nilsson, Artificial Intelligence: A New Synthesis, Morgan Kaufmann, 1998). Consider the following game tree in which the static scores (numbers in leaf boxes) are all from the MAX player's point of view.



   a. What moves should the MAX player choose?
   b. What nodes would not need to be examined using the alpha-beta algorithm – assuming that nodes are examined in the left-to-right order?