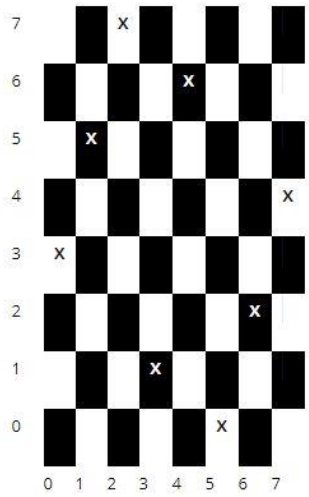
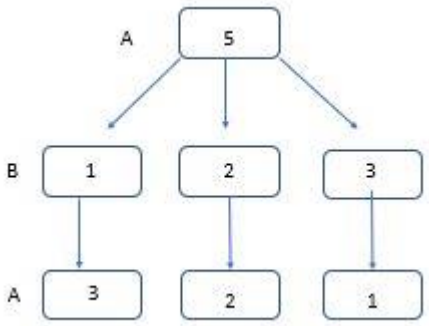
Sample Problems

1) Describe the search space and suggest A*-procedure for 8-queens problem. Show that your heuristic function h(n)=g(n)+h(n) satisfies the monotonic restriction [h(n) =< h(n*)].



2) The game NIM is played as follows: Two players alternate in removing one, two, or three pennies from a stack initially containing five pennies. The player who picks up the last penny loses. Show, by drawing the game graph, that the player who has the second move can always win.



What about if the stack contains 9 pennies?

3) Consider a sliding block puzzle with the following initial configuration:

b	b	b	w	w	w	e

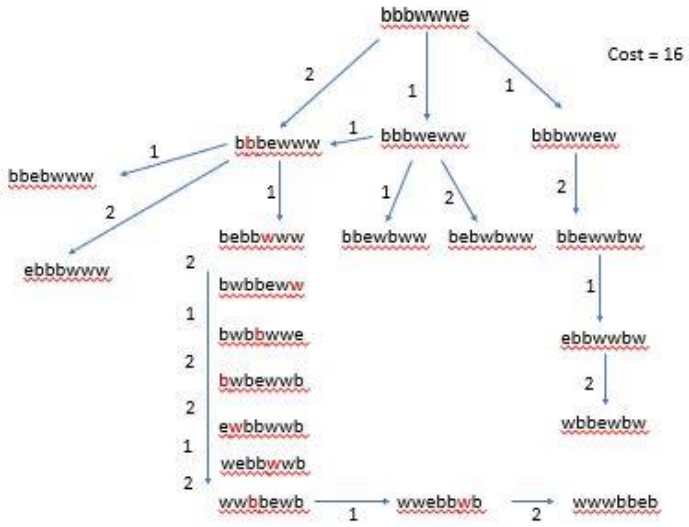
There are three black tiles (B), three white tiles (W), and an empty cell (E). The puzzle has the following moves:

(a) a tile may move into an adjacent empty cell with unit cost.

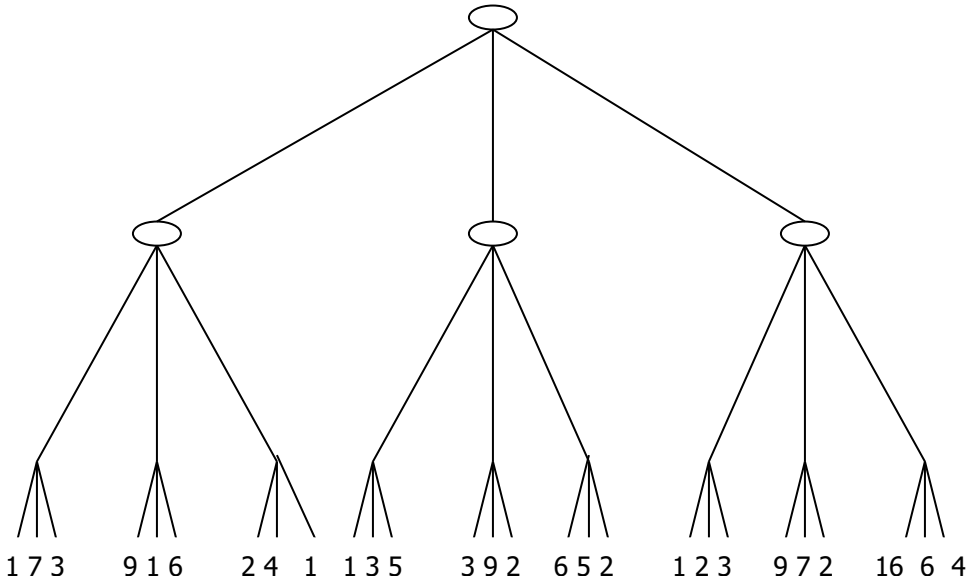
(b) a tile may hop over at most two other tiles into an empty cell with a cost equal to the number of tiles hopped over.

The goal of the puzzle is to have all of the white tiles to the left of all of the black tiles (without regard for the position of the blank cell).

Describe the search space and suggest A*-procedure for the sliding block puzzle. Show that your heuristic function h(n)=g(n)+h(n) satisfies the monotonic restriction [h(n) =< h(n*)].



4) Explain the alpha-beta search procedure using the game tree below. The root is a MAX node. How many nodes you do not need to visit?



5) In an ancient Hindu tea ceremony, there are three participants, an elder, a servant, and a child. The four tasks they perform are feeding the fire, serving cakes, pouring tea, and reading poetry; this order reflects the decreasing importance of the tasks. At the beginning of the ceremony, the child performs all four tasks. They are passed one at a time to the servant and the elder until, at the end of the ceremony, the elder is performing all four tasks. No one can take on a less important task than those they already perform. Generate a sequence of moves to transfer all the tasks from the child to the older. Propose an algorithm to perform the move sequence.