CS 6364: Homework 1
FALL 2015
INSTRUCTOR: VIBHAV GOGATE

1. Three missionaries and three cannibals come to a river. There is a boat on their side of the river that can be used by either one or two persons. How should they use this boat to cross the river in such a way that cannibals never outnumber the missionaries on either side of the river.

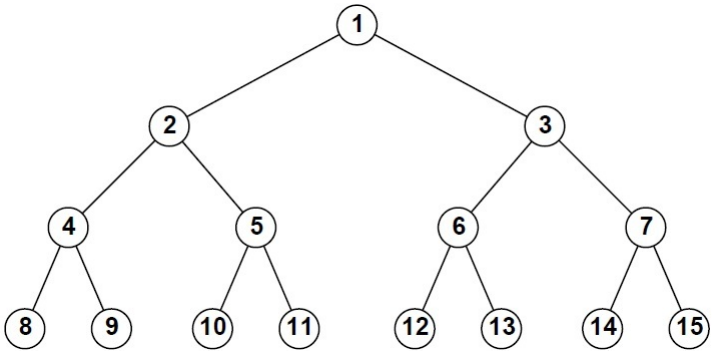
   (a) Specify the form of state description, the initial state and the goal state for this problem. Describe the state space using variables (as if you are using an array in a program). Determine how many states are in state space.

   (b) Describe the set of operators using if-then rules.

   (c) Draw the entire state space graph (include only legal states, that is, states in which cannibals do not outnumber missionaries on either side of the river)

   (d) Describe a depth-first search algorithm and show a trace leading to a solution.

2. Consider the search tree given below. The start state is number 1 and each state k has two successors: numbers $2k$ and $2k+1$. Suppose that the goal state is 12.



   (a) Assuming that you always expand left child first, list the nodes that will be visited by Iterative Deepening search (IDS).

3. Let m be the maximum-depth of the search tree, b be its branching factor and $d \leq m$ be the depth of the **unique path** to the (unique) goal state.

   (a) What is the minimum and maximum number of nodes that might be generated by depth-first search?

   (b) What is the minimum and maximum number of nodes that might be generated by breadth-first search?