

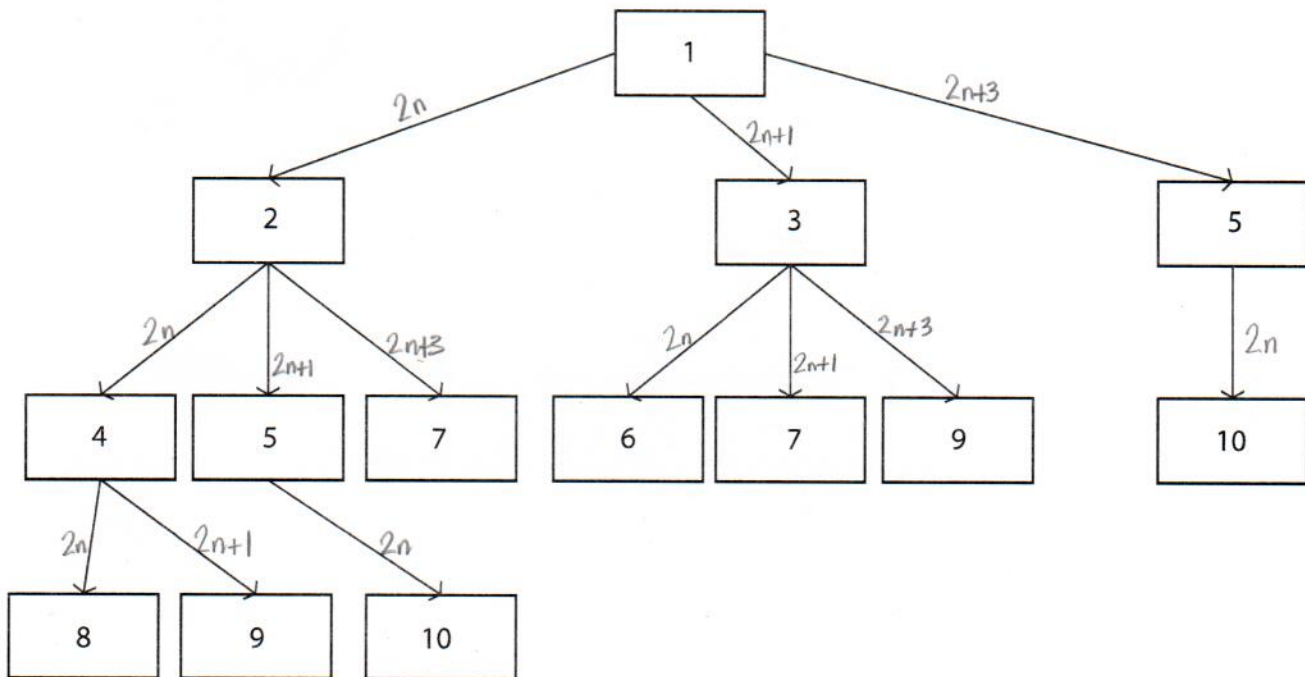
Homework 2

Due: Thu. Sep. 20, 11:00 PM

You may write or type your answers, but you must show all steps in your solutions to receive full credit.

1. Uninformed Search

- a. (3 points) Consider a state space where the starting/initial state is labeled 1 ($n=1$ for the initial state), and the successor function for state n returns three states: $2n$, $2n+1$, $2n+3$. Draw the search tree describing this state space for all states 1 to 10 (states may be repeated in the tree, but no state higher than 10).



- b. (6 points) Suppose the goal state is 7. Perform iterative deepening depth first search to solve the problem. For each step, clearly label the content of the frontier, the node being expanded, and the current arrangement of the search tree.

Step	Depth	Frontier	Tree Arrangement
1	1	①	1 $\xrightarrow{2n}$ 2
2	1	②, 1	1 $\xrightarrow{2n}$ 2
3	1	①	1 $\xrightarrow{2n}$ 2 1 $\xrightarrow{2n+1}$ 3
4	1	③, 1	1 $\xrightarrow{2n}$ 2 1 $\xrightarrow{2n+1}$ 3
5	1	①	1 $\xrightarrow{2n}$ 2 1 $\xrightarrow{2n+1}$ 3 1 $\xrightarrow{2n+3}$ 5
6	1	⑤, 1	1 $\xrightarrow{2n}$ 2 1 $\xrightarrow{2n+1}$ 3 1 $\xrightarrow{2n+3}$ 5
7	2	①	1 $\xrightarrow{2n}$ 2
8	2	②, 1	1 $\xrightarrow{2n}$ 2 $\xrightarrow{2n}$ 4
9	2	④, 2, 1	1 $\xrightarrow{2n}$ 2 $\xrightarrow{2n}$ 4
10	2	②, 1	1 $\xrightarrow{2n}$ 2 $\xrightarrow{2n}$ 4 1 $\xrightarrow{2n+1}$ 5
11	2	⑤, 2, 1	1 $\xrightarrow{2n}$ 2 $\xrightarrow{2n}$ 4 1 $\xrightarrow{2n+1}$ 5
12	2	②, 1	1 $\xrightarrow{2n}$ 2 $\xrightarrow{2n}$ 4 1 $\xrightarrow{2n+1}$ 5 1 $\xrightarrow{2n+3}$ 7
13	2	⑦, 2, 1 GOAL!!!	1 $\xrightarrow{2n}$ 2 $\xrightarrow{2n}$ 4 1 $\xrightarrow{2n+1}$ 5 1 $\xrightarrow{2n+3}$ 7

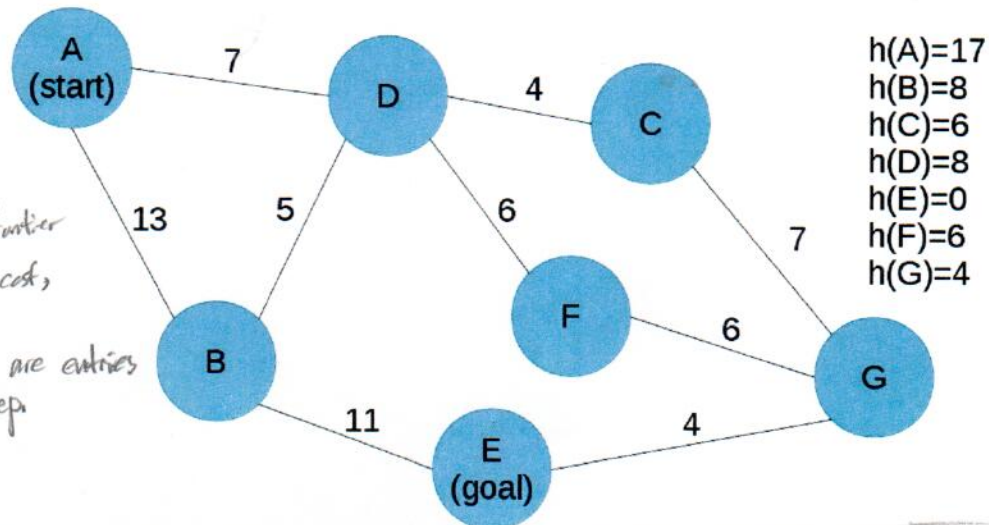
Notation:

- Circled numbers on the Frontier are the nodes which are being expanded.
- Arcs on the tree arrangement are labelled with the action which leads the parent state to the child state.

2. Informed Search - (6 points) Find the optimal path from A to E using A* Search. For each step, clearly label the content of the frontier, the node being expanded, and the current arrangement of the search tree.

Notation:

- (s, p, h) : Entries in frontier where s = state, p = path cost, h = heuristic cost
- Circled frontier entries are entries expanded on that step



Step	Frontier	Closed	Tree Arrangement
1	$(A, 0, 17)$		
2	$(D, 7, 8)$ $(B, 13, 8)$	A	
3	$(C, 11, 6)$ $(F, 13, 6)$ $(B, 12, 8)$ $(B, 13, 8)$	A, D	
4	$(F, 13, 6)$ $(B, 12, 8)$ $(B, 13, 8)$ $(G, 18, 4)$	A, D, C	
5	$(B, 12, 8)$ $(B, 13, 8)$ $(G, 18, 4)$ $(G, 19, 4)$	A, D, C, F	
6	$(B, 13, 8)$ $(G, 18, 4)$ $(G, 19, 4)$ $(E, 23, 0)$	A, D, C, F, B	
7	$(E, 22, 0)$ $(G, 19, 4)$ $(E, 23, 0)$	A, D, C, F, B, G, E	

GOAL!!!!!!