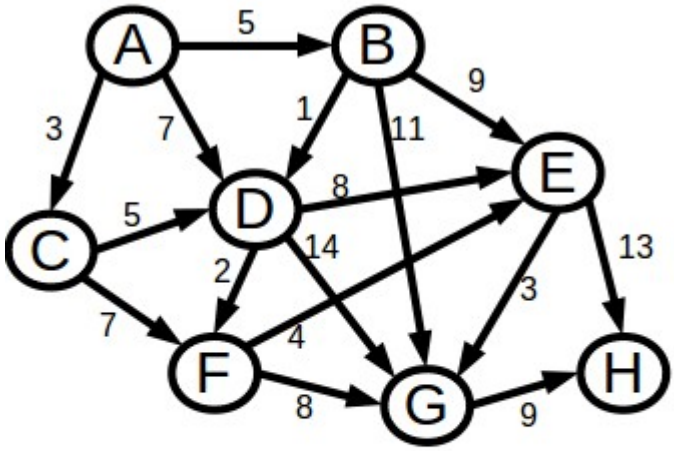
4511W, Fall-2019
ASSIGNMENT 2 :
Assigned: 09/24/19 Due: 10/01/19 at 11:55 PM (submit via Canvas, you may take a picture of handwritten solutions, but you must put them in a pdf) Submit only pdf or txt files

Written/drawn:

Problems 1 and 2 both relate to the following graph:



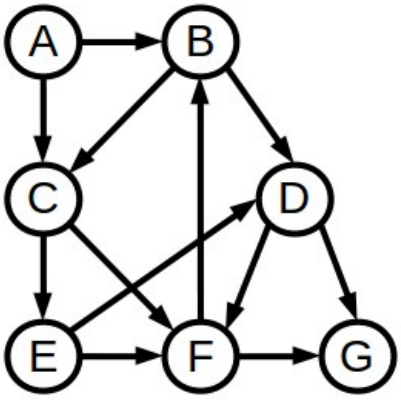
Heuristic (for goal node H):

A: 30	E: 8
B: 29	F: 13
C: 25	G: 9
D: 15	H: 0

Problem 1. (15 points)
Run A* search on the graph above assuming your initial state is “A” and the goal state is “H”. Show your work for what is in the fringe and explored sets at every step.

Problem 2. (10 points)
Are the heuristics above admissible? Are they consistent? Justify and show work for both of these answers.

Problem 3. (15 points)
(1) Convert the shown graph below into a tree, then run (2) Iterative Deepening Depth First Search (ID-DFS) on your tree to find the goal state “G” from the initial state “A”.



Problem 4, 5 and 6 all relate to the following situations (for each problem answer for all situations):

Situation 1. You are solving an 8-puzzle (the problem from the first part of last writing assignment).

Situation 2. You pack bags at a grocery store. There are a bunch of items (n-items) that need to go in bags... but there are some restrictions. Each item has a certain degree of fragility, and cannot receive over a set amount of weight on top of it (i.e. don't put milk on top of eggs unless you want a mess). Also, "wet" items cannot go in a paper bag, but paper bags are larger and can hold more weight/items. How would you pack bags to meet these requirements with using as few bags as possible.

Situation 3. Your parents bought a couch from IKEA, but then decided they wanted a different one. They give the couch to you instead, but they lost the assembly instructions somehow! (If you are unfamiliar with IKEA, they ship you wood planks with some pre-drilled holes that you then need to fit together (sorta like Legos).)

Problem 4. (15 points)
For each situation give an example state and actions (so we understand your formulation) and categorize your approach as either incremental or complete-state. (Along with a justification for why it falls in this category.)

Problem 5. (15 points)
For each situation would it be better to represent this problem as a tree or a graph? Justify your answer.

Problem 6. (20 points)
For each situation, pick one of the following algorithms you think would work best to solve the problem. Justify your answer.

Possible algorithms:

- -Breadth first search
- -Uniform cost search
- -Depth first search
- -Depth limited search
- -Iterative deepening depth first search
- -Bi-directional search

Programming (python/lisp):

Problem 7. (10 points)
Test bi-directional, breadth first and A* search a number of different 8-puzzles (enough to answer the question) and generalize which would work best. The AIMA's implementation of bidirectional search is a bit wonky, so use the provided "hw2.py" file as a starting point (this should be compatible with all three searches). The algorithms besides bidirectional search can be used directly as implemented in the AIMA code.

Also answer: what sub-search is being done from both initial and goal state in the implemented bi-directional search?

(Note: some arrangement of numbers in an 8-puzzle is impossible to solve.)