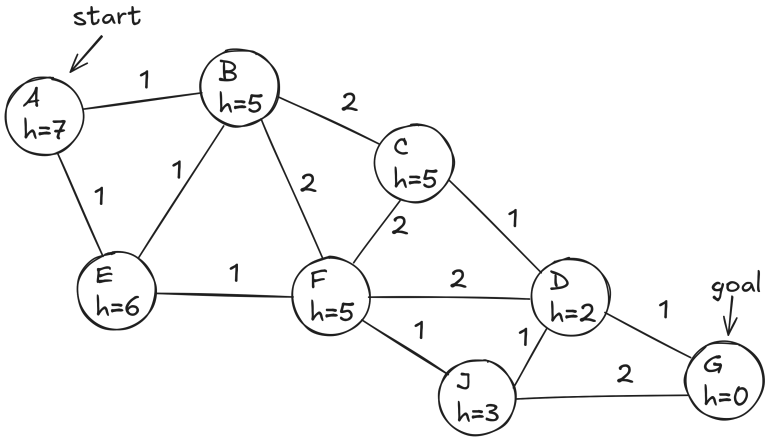
CSCI 4511/6511 - Exam Prep 1

Friday, 31 Jan 2025

Instructions:
This is ungraded exam prep to be completed as an in-class exercise.

1 Uniform-Cost Search

List the nodes in their **order of expansion** for UCS used to solve the following problem:

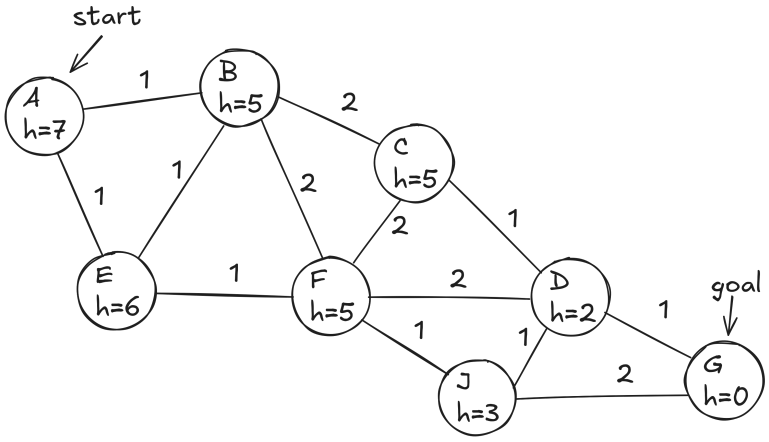


Edge weights are as marked. Ignore heuristic values.

For each node, include the *path* and the total *path cost* to each node.
Example (for one node): B , A $\rightarrow$ B , 1

2 A* Search

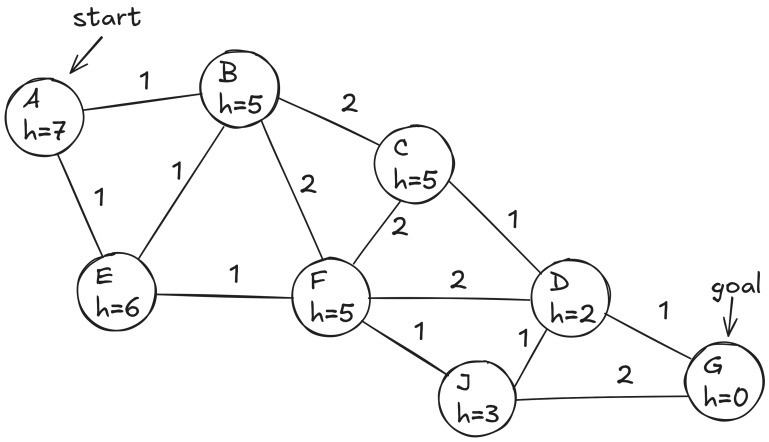
List the nodes in their order of expansion for A* used to solve the following problem:



Edge weights are as marked. Heuristic values are indicated for each node.
For each node, include the *path* and the total *path plus heuristic cost* to each node.
Example (for one node): B , A $\rightarrow$ B , 6

3 A* Search - Admissibility

For this problem, is the heuristic admissible? Why or why not.



4 Depth-Limited Search

Rewrite the Depth-First Search algorithm below to terminate in failure if the search tree is exhaustively searched to depth 6 (inclusive of the initial node) without reaching the goal.

Algorithm Depth-First Search

```
1:  function DEPTH-FIRST-SEARCH(problem)
2:      node ← NODE(STATE=problem.INITIAL)
3:      frontier ← LIFO stack
4:      frontier.PUSH(node)
5:      while not IS-EMPTY(frontier) do
6:          node ← POP(frontier)
7:          if problem.IS-GOAL(node.STATE) then
8:              return node
9:          else if not IS-CYCLE(node) then
10:             for each child in EXPAND(problem,node) do
11:                 frontier.PUSH(child)
12:     return failure
```

5 A* Search - Consistency

Prove that the Manhattan distance heuristic used in the Pacman environment from Homework 1 is consistent.

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