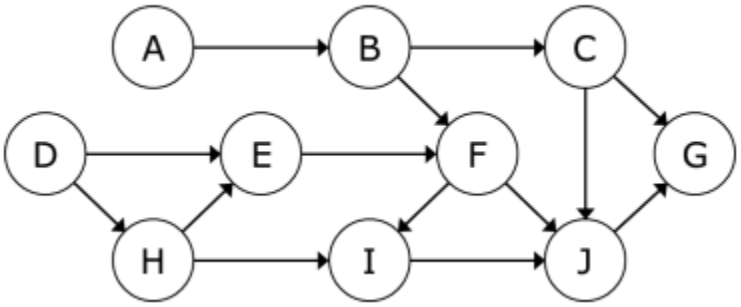
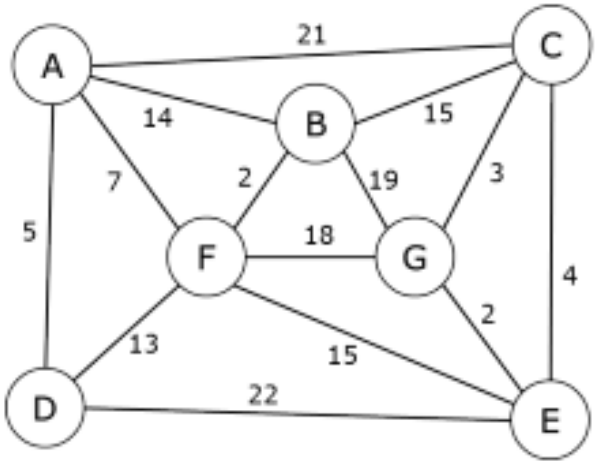
1. Considering the following directed graph:



Use Kahn's algorithm to find a valid topological sort order. Break ties **alphabetically.**

	In degrees									
Step	A	B	C	D	E	F	G	H	I	J
0	0	1	1	0	2					
1										
2										
3										
4										
5										
6										
7										

2. Consider the following undirected, weighted graph:



a) Step through **Prim's** algorithm to calculate a minimum spanning tree starting from vertex A. Break any ties in **alphabetical** order.

Step	Adding vertex	Edges in MST (so far)	MST cost (so far)
1	A	-	0
2	D	A-D	5
3			
4			
5			
6			
7			

b) Step through **Kruskal's** algorithm to calculate a minimum spanning tree of the graph. Break any ties in **alphabetical** order.

Step	Adding edge	Disjoint sets	MST cost (so far)
0	-	(A) (B) (C) (D) (E) (F) (G)	0
1	B-F	(A) (B,F) (C) (D) (E) (G)	2
2			
3			
4			
5			
6			
7			

c) Draw the Minimum spanning tree resulted from above algorithms.

3. Given input {4371, 1323, 6173, 4199, 4344, 9679, 1989} and a hash function h(x) = x % 10 for a table of size 10,

show the result:

(a). separate chaining hash table

(b). closed hash table using linear probing

(c). closed hash table using quadratic probing

4. Given input {43, 160, 61, 44, 67, 94, 37} and hash functions h1(x) = x/10 % 10 and h2(x) = 7 - (x % 7) , use double hashing to show the resulting hash table of size 10.

5. Create a new directory “HW4” in your github repo. For each of the following questions, create a single .cpp file with your code. (eg: 5a.cpp, 5b.cpp, …) You may discuss with your peers. If you’re stuck (after multiple attempts), you may look up online resources as long as you reference it, but you must NOT copy others’ code. you MUST produce your own code. It means you understand the algorithm and write your own code.

The following examples are not considered producing your own code, therefore it is unacceptable:

- You only make cosmetic changes from the online resources, eg: changing variable names, changing the order of functions, moving blocks of code into separate functions.
- You find a solution in a different language, and translate it into c++
- You copy directly from some resources for any part of your code.

Please add proper comments in your code so that other people (and yourself!) can understand what the code is doing (even a few years later). Make sure your code passes all the test cases in leetcode . Finally, push your code under the HW4 folder.

- Please add proper comments in your code.
- Make sure your code passes all the test cases in leetcode .
- Push your code under the HW4 folder.
- Create a README.md file under the HW4 folder that shows how many test cases passed for each question.

(a) https://leetcode.com/problems/min-cost-to-connect-all-points/
(b) https://leetcode.com/problems/isomorphic-strings/