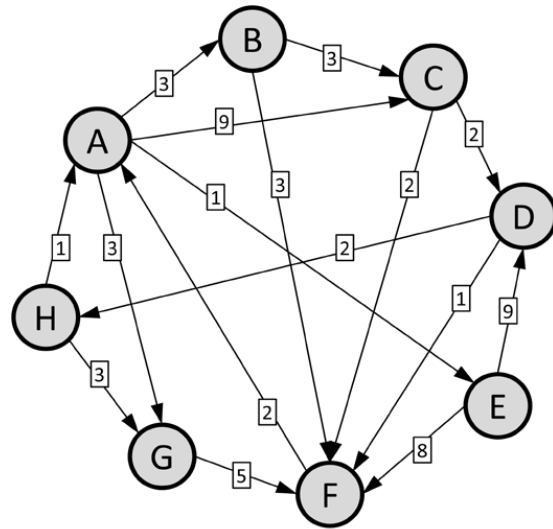


Final Practice Problems (from Spring 2012, by Nick Howe)

1. Graphs

a.) Consider the directed graph at right. Simulate Dijkstra’s shortest path algorithm starting at node H. In your results, give (i) the order in which the nodes are visited, (ii) all the cost labels computed for each node as the algorithm runs, and (iii) the homeward pointing edge associated with each of those costs. (For example, for node X you might say that the initial infinite cost was replaced with a cost of 12 via node Y, then with a cost of 8 via node Z, and finally with a cost of 7 via node W.)



b.) For which starting nodes could node E appear in the fourth position of a breadth-first traversal? You may break ties in any manner you please. For example, BFAECGDFH is a valid breadth-first traversal that starts at B and has E in the fourth position, so you would list B as part of your answer.

2. Hash Tables

Consider the hash table shown below, which uses the simple hash function $h(k) = k \bmod 7$ and handles collisions via simple linear probing. Answer the questions that follow.

a.) List all the (key,value) pairs that are not stored at their home position in the table.

b.) List all the (key,value) pairs which, if removed, would cause other (key,value) pairs to change their position.

c.) If the table was initially empty, and the (key,value) pairs you see were added in some sequence without any other intervening operations, what can you infer about their relative order of insertion? List all sets of (key,value) for which you can determine that one must have been inserted before the other, and give the ordering.

Key	Value
49	Tango
13	Alpha
73	Charlie
24	Bravo
20	Foxtrot

3. Java Style

Rewrite the snippets of Java code below either to make them more efficient or more in line with the style guidelines promoted in this course. The effect should remain unchanged.

a.)

```
if (x==7) {  
    return true;  
} else {  
    return false;  
}
```

b.)

```
public int addOne(int x) {  
    return x+1;  
}  
  
public int addTwo(int x) {  
    return x+2;  
}  
  
public int addThree(int x) {  
    return x+3;  
}
```

4. Heaps

Does the following array qualify as a max heap? Why or why not?

{Z, S, I, H, A, B, E, F, C}

How can this array be used to execute heap sort? Write out your steps.