Sample problems for CS146

1. Problems 9.1, 9.5, 9.7a from the book

2. Consider the array of numbers:

2, 1, 34, 5, 23, 47, 11, 3, 45

and suppose you sort this array using the heap sort. List all the comparisons that are made in the process.

3. Consider the following heap:

```
  75
 /  \
39   53
 /  \
6    39
  /  \
4    47
 /  \
2    11
```

Show how the heap looks like in the array form. Suppose an element 23 is inserted. List all the comparisons made. Suppose after that, the largest element is removed and the heap is readjusted. Show all the comparisons that result.

4. Consider the following array of numbers:

54, 2, 43, 12, 67, 32, 56, 12, 11, 23, 27

and suppose you sort this array using the non-recursive merge-sort. Show the shape of the array after each pass.
5. Write a simple minded split method for the quick sort as follows:
Given a sub-array \(a[left], \ a[left + 1], \ a[left + 2], \ldots, \ a[right]\) to split, do the following:
1. Create a temporary array \(temp\) of size \(right - left + 1\)
2. Use \(a[left]\) as the pivot.
3. Go through the array \(a\) and compare each element \(a[i]\) of with pivot. If \(a[i] < pivot\), place \(a[i]\) on the left in \(temp\), otherwise, place it on the right.
4. Copy the array \(temp\) back to \(a\)
4. Return the midpoint.

6. Consider the following graph \(G\):

The vertices of \(G\) are to be traversed beginning with vertex \(D\).

a. List the order in which the vertices are visited in the breadth-first search
b. List the order in which the vertices are visited in the depth-first search.

When considering available candidates for pushing on the stack, or inserting into a queue, choose the one which is smallest alphabetically.
7. Consider the following tree game:

Suppose the player Min just marked the node $\alpha$ with $O$. What is the Max's best move?

8. Suppose a graph $G$ has 123 vertices. How many edges does the minimal spanning tree have?