CS 171 Assignment 4

1. Suppose that a client performs an intermixed sequence of (queue) enqueuer and dequeuer operations. The enqueue operations put the integers 0 through 9 in order onto the queue; the dequeue operations print out the return value. Which of the following sequence(s) could not occur?

a. 0 1 2 3 4 5 6 7 8 9

b. 4 6 8 7 5 3 2 9 0 1

2. Implement the following operations of a queue using stacks.

- push(x) -- Push element x to the back of queue.
- pop() -- Removes the element from in front of queue.
- peek() -- Get the front element.
- empty() -- Return whether the queue is empty.

Example:

```
MyQueue queue = new MyQueue();
queue.push(1);
queue.push(2);
queue.peek();  // returns 1
queue.pop();   // returns 1
queue.empty(); // returns false
```

Notes:

- You must use *only* standard operations of a stack -- which means only push to top, peek/pop from top, size, and is empty operations are valid.
- Depending on your language, stack may not be supported natively. You may simulate a stack by using a list or deque (double-ended queue), as long as you use only standard operations of a stack.
- You may assume that all operations are valid (for example, no pop or peek operations will be called on an empty queue).

```
class MyQueue {
```

```
    /** Initialize your data structure here. */
    public MyQueue() {

    }

    /** Push element x to the back of queue. */
    public void push(int x) {

    }

    /** Removes the element from in front of queue and returns that element. */
    public int pop() {

    }

    /** Get the front element. */
    public int peek() {

    }

    /** Returns whether the queue is empty. */
    public boolean empty() {

    }
}
```

3. (a) Which method runs faster for an array with all numbers identical, selection sort or insertion sort?

(b) Which method runs faster for an array in reverse order, selection sort or insertion sort?

4. Suppose that we use insertion sort on a randomly ordered array where items have only one of three values. Is the running time linear, quadratic, or something in between?