COMP 410 - Spring 2014
Programming Assignment 1

PROJECT DESCRIPTION

A VipQueue is a regular queue enhanced with an additional enqueue operation called an vipEnqueue, which allows an item to be added to the front of the queue. The following “main” class illustrates the use of a VipQueue of integers:

```java
import comp410.vipqueue.VipQueue;
public class Tester {
    public static void main(String args[]){
        VipQueue<Integer> vq = new VipQueue<Integer>(10);
        for (int i=0; i<5; i++){
            if (!vq.isFull()) vq.enqueue((Integer)i); //a "regular" enqueue
            if (!vq.isFull()) vq.vipEnqueue((Integer)(i*i)); //a vip enqueue
        }
        while (!vq.isEmpty()) System.out.printf("->%d", vq.dequeue());
    }
}
```

Executing the code above should yield output that looks like this:

```
->16->9->4->1->0->0->1->2->3->4
```

For this assignment you are to implement a VipQueue class that supports the operations illustrated in the Tester class above. This is how you should proceed.

1) Implement a Stack class that supports the operations in Appendix A. This Stack should be implemented as a linked list.
2) Implement a Queue class that supports the operations in Appendix A. This Queue should be implemented as an array.
3) Implement your VipQueue class such that each VipQueue object is represented as a single Stack object and a single Queue object. That is, the only data members of your VipQueue class should be one Stack, one Queue, and perhaps some constant number of additional primitive variables (integers, booleans, etc.).
4) You may assume that the enqueue and vipEnqueue methods have the precondition that the vipQueue not be full, and that your dequeue operation has the precondition that the vipQueue not be empty.

NOTE

Do not use any in-built Java implementation (e.g., Stack, Queue, Lists, ArrayList, etc) from the java.util.* API. You must implement the above from scratch.

GRADING RUBRIC

- (15 points) Stack correctly implemented using a linked list
- (15 points) Queue correctly implemented using an array
- (10 points) Use of generics
- (15 points) VipQueue enqueue method implementation
- (15 points) VipQueue vipEnqueue method implementation
- (20 points) Other VipQueue methods
- (10 points) Clean code
**Submission Instructions**
Upload all your source code in a .zip file to Sakai. You are responsible for ensuring that your program compiles and functions properly. Any non-functioning program will receive a zero.

**Honor Code**
Please review the honor code description from the course syllabus. No collaboration (with anyone) is permitted in assignments. Collaboration in assignments, or the use of code not the students own, constitutes an honor code violation. Any violation will be reported to the Student Attorney General.

**Appendix A: Required Methods**
Your Stack class should support the following constructor and operations (T is a generic type):

```java
public Stack(int capacity)
public boolean isEmpty()
public boolean isFull()
public T peek()
public T pop()
public void push(T element)
```

Your Queue class should support the following constructor and operations (T is a generic type):

```java
public Queue(int capacity)
public boolean isEmpty()
public boolean isFull()
public T peek()
public T dequeue()
public void enqueue(T element)
```

Your VipQueue class should support the following constructor and operations (T is a generic type):

```java
public VipQueue(int capacity)
public boolean isEmpty()
public boolean isFull()
public T peek()
public T dequeue()
public void enqueue(T element)
public void vipEnqueue(T element)
```