COS226 Week 2 Activity

1. *Generics, iterators, autoboxing, and mathematical analysis. Algorithms textbook 1.3*

   Use the class shown here: http://algs4.cs.princeton.edu/13stacks/ResizingArrayStack.java.html

   ```
   ResizingArrayStack<Character> stack = new ResizingArrayStack<Character>();
   stack.push('A');
   stack.push('C');
   stack.push('T');
   for (char left : stack)
       for (char right : stack)
           StdOut.println(left + " " + right);
   ```

   (a) What does the above code fragment output to standard output?

   (b) If N characters are pushed onto the stack initially (instead of 3), how many lines of output does the above code fragment produce as a function of N?

2. *Unit testing.* Describe three ways to test the correctness of the implementation of `ResizingArrayStack`.

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3. *Stacks, queues, and amortized analysis. Algorithms textbook 1.3* Describe an implementation of a queue using two stacks, where each operation (*construct, push,* and *pop*) takes a constant *amortized* number of stack operations. Explain why, starting from an empty queue, any sequence of N queue operations takes proportional to N stack operations, in the worst case.

4. *Shellsort. Algorithms textbook 2.1* Show, in the style of the trace of Algorithms p. 260, the result of using shellsort to sort the keys: S O R T E X A M P L E. Assume the values of h = 7, 3, 1.