Do not turn this page until you have received the signal to start.
(In the meantime, please fill out the identification section above, and read the instructions below carefully.)

This midterm test consists of 2 questions on 4 pages (including this one), printed on one side of the paper. When you receive the signal to start, please make sure that your copy of the test is complete. If you need more space, use the reverse side of the page and indicate clearly the part of your work that should be marked.

Marking Guide

# 1: _____/25
# 2: _____/ 7
TOTAL: _____/32

Good Luck!
Question 1.  [25 marks]
Note: read parts (a) and (b) completely before answering.

Part (a)  [9 marks]
Consider the following partially-implemented class, Advertisement. Write the two missing methods setCharacterRate, addText, and the constructor.

```java
/** An Advertisement holds text in currentText, maximumText is the
 * maximum number of characters allowed in an Advertisement. All
 * Advertisements are charged a standard characterRate.
 */
public class Advertisement {

    private static int characterRate; // cents-per-character charged on every Advertisement
    private int maximumText; // maximum number of characters in this Advertisement
    private String currentText; // text currently in this Advertisement

    // [3 marks]
    // setCharacterRate: set the characterRate to r for every Advertisement.
    public static void setCharacterRate(int r) {
        characterRate = r;
    }

    // getCharactersRemaining: return the number of characters that can
    // be added to the current text without exceeding maximumText characters.
    public int getCharactersRemaining() {
        return maximumText - currentText.length();
    }

    // [3 marks]
    // constructor: create an Advertisement with room for up to
    // n characters.
    public Advertisement(int n) {
        maximumText = n;
    }

    // [3 marks]
    // addText: add text t to the end of currentText.
    // There is no need to check whether you have exceeded
    // the maximum number of characters allowed.
    public void addText(String t) {
        if (currentText == null) {currentText = "";}
        currentText += currentText + t;
    }
}
```
Part (b)  [6 marks]
follow the instructions given in the comments for the class ClassifiedAds below. This class uses Advertisement from part (a).

/** ClassifiedAds models a collection of classified ads, and uses
   * the class Advertisement. */
public class ClassifiedAds {
    public static void main(String[] args) {
      // [1 mark] Write a line of Java to set the
      // charge-per-character of every Advertisement to 10
      Advertisement.setCharacterRate(10);

      Advertisement sale= new Advertisement(75);
      String s = "Going out of business! Everything must go!\n"

      // [1 mark] Write a line of Java that adds s to the text of sale.
      sale.addText(s);

      String moreText= "All socks 50% off, shoes even less!\n"

      // [4 marks] write a code fragment (several lines of code) that
      // checks to see whether there is enough room to add moreText
      // to the text of sale. If there is, add moreText, and
      // print "Characters remaining: X" where X is the number of
      // characters remaining after you have added moreText. Otherwise,
      // print "Not enough room." and do not add moreText.
      if (sale.getCharactersRemaining() >= moreText.length()) {
        sale.addText(moreText);
        System.out.println("Characters remaining: " +
                         sale.getCharactersRemaining());
      }
      else {
        System.out.println("Not enough room.");
      }
    }
}

Part (c)  [1 mark]
write the output of ClassifiedAds. Assume that s.length() is 44 and moreText.length() is 36.

Not enough room.
Part (d) [2 marks]
Write the name of each instance variable in Advertisement and ClassifiedAds.

maximumText, currentText

Part (e) [3 marks]
Write the name of each local variable in Advertisement and ClassifiedAds.

sale, s, moreText

Part (f) [3 marks]
Write the name of each parameter in Advertisement and ClassifiedAds.

r, n, t, args

Part (g) [1 mark]
Write the name of each static variable in Advertisement and ClassifiedAds.

characterRate

Question 2. [7 marks]

Part (a) [2 marks]
The class String is a standard part of Java, and a String is immutable (unchangeable). In light of this, explain why (or why not) the following code fragment is possible in Java:

String s = "hi";
String t = "there";
s = t;
This fragment first assigns the address of String "hi" to variable s, then assigns the address of String "there" to variable t, and finally assigns the address contained in t to s. No String objects are changed, simply the address stored in variable s.

Part (b) [5 marks]
Complete the method chopString below.

/** chopString removes the last s.length()/2 characters from the
 * end of s, adds them to the beginning (in the same order), and
 * returns the result. You may assume that s is not null.
 * */
public static String chopString(String s) {
    int mid = s.length() - s.length()/2;
    return s.substring(mid) + s.substring(0, mid);
}