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CS 1713 Exam 2 — Fall 2008

This is a closed book exam. Answer all questions on these sheets.

1) (20 points)

a) Write a public method, **linearSearch**, that uses a linear search to find the first position in an array of **String** of a given **String**. Return -1 if it is not found.

b) Write a public method, **binarySearch**, that uses a binary search to find a position in an array of **String** of a given **String**. Return -1 if it is not found. Assume the array is sorted in increasing order.

- 2) (20 points) Write a method to sort an array of integers in increasing order using an insertion sort. You may (and it is recommended that you) have your sort method call another method, but you need to write that other method also.

3) (10 points)

- 1) It takes about 7 seconds to search a given array using a linear search. How long would you expect it to take to search an array of five times the size?
- b) It takes about 10 seconds to sort a different array using a selection sort. How long would you expect it to take to sort an array of five times the size?
- c) It takes about 3 seconds to search a sorted array of 1 million elements using a binary search. How long would you expect it to take to search a similar sorted array of 4 million elements? Explain how you got your answer.

4) (10 points) Write a method that has two **String** parameters and returns true when the second **String** occurs in the first **String** exactly twice. Return false otherwise.

5) (12 points) Suppose we have the following declaration:

```
String s = "Next one is CS 2123";
```

Find the value of each of the following:

a) **s.charAt(2);**

b) **s.indexOf("one");**

c) **s.indexOf("Two");**

d) **s.length();**

e) **s.substring(6);**

f) **s.substring(2,6);**

6) (8 points) Write a method that takes an array of doubles as a parameter and returns true if the array is sorted, and false, otherwise.

- 7) (8 points) Suppose **Rectangle** is a class that has been appropriately written. It has a constructor with 2 double parameters, a width and length in this order. Draw an accurate schematic diagram of the program variables showing the execution of the program.

```
double w = 2;
double x = 5;
double y = 7;
Rectangle r1;
Rectangle r2;
Rectangle r3;
r1 = new Rectangle(w, x);
r2 = new Rectangle(y, w);
r3 = r2;
x = r1.getWidth();
y = r3.getLength();
r2 = r1;
r2.setWidth(15);
w = r1.getWidth();
r3 = r1;
y = r3.getLength();
x = r1.getWidth();
```

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- 8) (12 points) The tables below show an array of 8 integers. Fill in each table with a trace of the indicated sort applied to this array. The sort will sort the elements in ascending (increasing) order. Each line in the table should be filled in with the values of the array after one pass through the main loop of the sort. There may be are more lines in the table than needed.

If you make a mistake and would like another copy of the table to fill in, ask for it.

Selection Sort

[illegible]

Insertion Sort

[illegible]