CSC 260.002 Midterm 2 answer key

1. What is method overloading? Give an example of why or how you might use it (no code, just an example). (6 points)

Naming multiple methods with the same name but each having its own parameter profile. We might for instance have several max methods, one to find the max of 2 ints, one to find the max of 2 doubles, one to find the max of 2 Strings, etc.

2. Write a method which receives two double arrays and computes and returns the dot product of the arrays. The dot product of a and b is a[0] * b[0] + a[1] * b[1] + a[2] * b[2] + ... Both arrays are filled so that the arrays' lengths are equal to the number of elements stored in the arrays but the two arrays may not be the same length. Only compute the dot product up to the last value in the *shorter* array. For instance, if a has 8 items and b has 6, only compute the dot product of the first 6 indices. (12 points)

```
public static double dot(int[] a, int[] b) {
    int n;
    if(a.length>b.length) n = b.length;
    else n = a.length;
    double sum = 0.0;
    for(int i=0;i<n;i++)
        sum+=a[i]*b[i];
    return sum;
}</pre>
```

3. The following code has several syntax errors. Identify as many as you can. (9 points) public static String question4 (int x, y);

```
{
    int a, x;
    a = x++ * y;
    if(a > x) return true;
    if(a < x) return false;
}</pre>
```

- 1. Return type should be boolean
- 2. no type before y in parameter list
- 3. header must not end with ;
- 4. x declared in both parameter list and in the method
- 5. there is no return statement in the case where a == x

4. Write a method which receives three Strings that are a person's first name, middle name and last name, and return a String that is the initials of the person's full name with periods after each initial. Note: as a person may not have a middle name, the second String might equal the value "", in which case only return the initials for the first and last names. For instance, if the Strings are "Frank", "Vincent" and "Zappa", it should return "F.V.Z." and but if they are "Frank", "", "Zappa", it should return "F.Z." (9 points)

```
public static String initials(String f, String m, String l)
{
    if(m.equals("")) return "" + f.charAt(0) + "." +
        l.charAt(0) + ".";
    else return "" + f.charAt(0) + "." + m.charAt(0) +
        "." + l.charAt(0) + ".";
```

5. We want a method that will swap two elements of an array. For instance, swap(a[i], a[j]). The code below does not work. Explain why and rewrite both the method call and the method so that it will function as we would expect. (10 points)

Method call:

```
swap(a[i], a[j]);
Method:
    public static void swap(int x, int y) {
        int temp = x;
        x = y;
        y = temp;
    }
```

Since the two params are primitive data types, they are passed by copy so swap does swap x and y but it does not impact the array itself. Pass the array, i and j:

```
swap(a, i, j);
public static void swap(int [] a, int i, int j) {
    int temp = a[i];
    a[i] = a[j];
    a[j] = temp;
}
```

6. In order to use binary search on an array, what must be true of the array? Why might you use it instead of a sequential search? (8 points)

Array must be sorted. Binary search is far more efficient. With 1000 elements, binary search will find the item in no more than 10 searches while sequential search may to 1000. With 1 million elements, the difference is 20 to 1 million!

7. The following method inputs values from the keyboard into an array and returns them. We want to modify this so that the method instead inputs from the disk file "foo.txt". Rewrite the method to do so. (12 points)

```
public static int[] inputArray() {
          Scanner in = new Scanner(System.in);
          int[] values = new int[100];
          System.out.print("Enter a value, -1 to exit ");
          int temp = in.nextInt();
          int n = 0;
          while(temp>=0&&n<100) {</pre>
               values[n] = temp;
               n++;
               System.out.print("Next value, -1 to exit ");
               int temp = in.nextInt();
          }
          return values;
     }
public static int[] inputArray() throws IOException {
     Scanner in = new Scanner(new File("foo.txt"));
     int[] values = new int[100];
     int count = 0;
     while(in.hasNext()&&count<100) {</pre>
          values[count] = in.nextInt();
          count++;
     }
     in.close();
     return values;
}
```

8. Given the following array, show how the following two sort algorithms will sort the list of values pass-by-pass (that is, show how each array will look after each pass down the array). (12 points)
5
8
3
4
10
2

a.	Bubble sort	b. Selection sort
	5348210	2834105
	3 4 5 2 8 10	2 3 8 4 10 5
	3 4 2 5 8 10	2 3 4 8 10 5
	3 2 4 5 8 10	2 3 4 5 10 8
	2345810	2345810
	2345810	

9. What is the difference between an iterator for loop and a counting for loop? Provide an example of an iterator for loop by iterating through an array and outputting each element. (6 points)

The counting loop uses a loop index and counts the number of iterations, ending once the loop index has reached the ending point whereas the iterator loop iterates once for each item in the container item (e.g., an array), and stores each of those elements in the loop variable.

```
for(String temp : someStringArray)
    System.out.println(temp);
```

10. Write a method which receives a String array, the number of elements stored in the array and a target String and which determines how many times the target value appears in the array, returning that count. (8 points)

```
public static int countOccurrences(String[] array, int n,
    String target) {
        int count = 0;
        for(int i=0;i<n;i++)
            if(array[i].equals(target)) count++;
        return count;
    }
```

11. Write a method which receives an int array and the size of the array, creates a new array twice its size, copies the elements into the new array and returns the new array. (8 points)

```
public static int[] arrayDouble(int[] array, int n) {
    int[] temp = new int[2*n];
    for(int i=0;i<n;i++)
        temp[i] = array[i];
    return temp;
}</pre>
```