CS 1083
Introduction to Programming I for Computer Scientists
Final

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NAME:__________________________

**Instructions**
1. Do all of the 8 problems
2. You have 120 minutes for the exam
3. Show all your work
4. Do not separate midterm papers

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1. (10 pts) What is printed by the following program? Show all your work for partial credit.

```java
public class Finalq1 {
    public static void main(String[] args) {
        double x=4, y=3, z=5, t=4;

        x = mystery(y,z);
        System.out.println("1: x = " + x);

        x = mystery(y,mystery(z,t));
        System.out.println("2: x = " + x);

        x = Math.pow(mystery(2,2),2);
        System.out.println("3: x = " + x);

        x = Math.sqrt(mystery(y-1,z+t-1));
        System.out.println("4: x = " + x);

        x = mystery(1+2,2+3);
        System.out.println("5: x = " + x);

        x = mystery(2,3)+mystery(4,2);
        System.out.println("6: x = " + x);

        x = mystery(4,mystery(3,2));
        System.out.println("7: x = " + x);

        x = mystery(mystery(2,3),mystery(3,4));
        System.out.println("8: x = " + x);
    }

    public static double mystery(double x, double y) {
        return(x*y);
    }
}
```

**Output:**

```
1: x = 15.0
2: x = 60.0
3: x = 16.0
4: x = 4.0
5: x = 15.0
6: x = 14.0
7: x = 24.0
8: x = 72.0
```
2. (10 pts) What is printed by the following program? Show all your work for partial credit.

```java
public class Finalq2 {
    public static void main(String[] args) {
        int i;
        for (i=1; i<5; i++) {
            printstarplus(i, 5-i);
        }
        printstarplus(5, 0);
        for (i=4; i>=1; i--) {
            printstarplus(i, 5-i);
        }
    }
    public static void printstarplus(int a, int b) {
        int i;
        for (i=0; i<a; i++)
            System.out.print("*");
        for (i=0; i<b; i++)
            System.out.print("+");
        System.out.println();
    }
}
```
3. (10 pts) What is printed by the following program? Show all your work for partial credit.

```java
public class Finalq3 {
    public static void main(String[] args) {
        String s = "abcdefghgfedcba";

        System.out.println(s.indexOf("efg"));
        System.out.println(s.substring(7,10));
        System.out.println(s.lastIndexOf("a"));
        System.out.println(s.toUpperCase());
        System.out.println(s.length());
        System.out.println(s.endsWith("cba"));
        System.out.println(s.charAt(s.length()-1));
        System.out.println(s.indexOf(Character.toLowerCase('H')));
    }
}
```

```
5
abcdefg

4
7
14
ABC
15
true
7
```

4. (15 pts) You need to implement two methods for this problem. First method `CountLowerCase` takes a string as a parameter and returns the number of lower case characters in the string. For example for "Apple" it returns 4 since p, p, l and e are lower case characters. Second method `AllUpperCase` takes a string as a parameter and returns true if all the characters are uppercase and false otherwise. You need to use `CountLowerCase` in implementing `AllUpperCase`. For example for "APPLE" it returns true since all the characters are uppercase. Note that you may have spaces, digits and other symbols in the strings for both methods.

```java
public static int countLowerCase(String s)
{
    int count = 0;
    for (int i = 0; i < s.length(); i++) {
        if (Character.isLowerCase(s.charAt(i)))
            count++;
    }
    return count;
}

public static boolean allUpperCase(String s)
{
    if (countLowerCase(s) == 0)
        return true;
    else
        return false;
}
```
5. (15 pts) Complete the following program to do pairwise reverse of an integer array. Pairwise reverse takes elements 2 at a time and swaps them. For the below array [6, 2, 3, 4, 5, 10, 1, 7, 6, 9] reverse reverse operation results in the following array [2, 6, 4, 3, 10, 5, 7, 1, 9, 6].

```java
import java.util.*;
public class Finalq5{
    public static void main(String[] args) {
        int[] numbers = {6,2,3,4,5,10,1,7,6,9};
        int i,temp;

        // write your code below

        for (i = 0; i < numbers.length - 1; i += 2) {
            temp = numbers[i + 1];
            numbers[i + 1] = numbers[i + i + 1];
            numbers[i] = temp;
        }
        System.out.println(Arrays.toString(numbers));
    }
}
```
6. (10 pts) What is printed by the following program? Show all your work for partial credit.

```java
import java.util.*;
public class Finalq6{
    public static void main(String[] args) {
        int[] numbers = {1,2,3,4,5,6,7,8};
        update(numbers);
        System.out.println(Arrays.toString(numbers));
    }

    public static void update(int[] data) {
        int i;
        for (i=1;i<data.length; i++) {
            data[i] = data[i]+data[i-1];
        }
    }
}
```

Data:

\[
\begin{array}{cccccccc}
1 & 3 & 6 & 10 & 15 & 21 & 28 & 36 \\
\end{array}
\]

Calculations:

\[
\begin{align*}
data[1] & = data[0] + data[1] = 1 + 2 = 3 \\
\end{align*}
\]
7. (15 pts) Write a complete program to read 8 positive integers from the user, compute and print the largest and second largest elements. You can assume that all the numbers entered will be positive.

```java
import java.util.*;
public class Finalq7 {
    public static final Scanner console = new Scanner(System.in);
    public static void main(String[] ages) {
        int i, num, max = 0, max2 = 0;
        for (i = 0; i < 8; i++) {
            num = console.nextInt();
            if (num > max) {
                max2 = max;
                max = num;
            } else if (num > max2) {
                max2 = num;
            }
        }
        System.out.println("Largest = "+max);
        System.out.println("Second Largest = "+max2);
    }
}
```
8. (15 pts) Write a method called before that takes four parameters: first month, first day, second month and second day and determines whether the first month and day combination appears before second month and day combination. It returns true if the first combination is before and false otherwise. Sample executions are given below.

`before(10,24,11,10) returns true`
`before(10,24,10,10) returns false`
`before(10,24,10,24) returns false`

```java
public static boolean before (int m1, int d1, int m2, int d2) {
    if (m1 < m2)
        return (true);
    else if (m1 == m2 && d1 < d2)
        return (true);
    return (false);
}
```