Exam 3

Student

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Total Points

104.5 / 130 pts

Question 1

Basic Java, Loops & Conditionals, Input and Output   **27** / 30 pts

1.1 **Which of the following statements is NOT true?**   **2** / 2 pts

> ✔ **+ 2 pts** Correct
>
> **+ 0 pts** Incorrect

1.2 **What is the output of the following code?**   **2** / 2 pts

> ✔ **+ 2 pts** Correct
>
> **+ 0 pts** Incorrect

1.3 **Suppose myArray is an array of integers. What is the bug in the following code?**   **2** / 2 pts

> ✔ **+ 2 pts** Correct
>
> **+ 0 pts** Incorrect

1.4 **For the following code assume a and b are 1D arrays with the values: a = [2 4 3 5] and**   **4** / 4 pts
b = [1 2 3]. What is being printed?

> ✔ **+ 4 pts** Correct
>
> **+ 0 pts** Incorrect

1.5 Write the method sameValues(int[][] a, int col) that returns true if there are two 🚩 **7** / 10 pts
elements with the same value on column col. It returns false otherwise.

✔ **+ 10 pts** Correct

```java
public static Boolean sameValues(int[][] a, int col)
{
int n = a.length;
    for (int i = 0; i < n; i++) {          /* 2 pts */
        for (int j = i+1; j < n; j++) {    /* 2 pts */
            if (a[i][col] == a[j][col]) return true;      /* 5 pts */
        }
    }
    return false; /* 1 pts */
}
```

+ 0 pts Incorrect

+ 2 pts partial for correct outer for loop

+ 2 pts partial for correct inner for loop

+ 5 pts for correct conditional

+ 1 pt returning false correctly

💬 **− 3 pts** int y = a[j][col] is the correct line (-3 pts)

1.6 Consider the following function foo.   **10** / 10 pts

✔ **+ 10 pts** Correct

+ 0 pts incorrect

+ 5 pts A: Given an input from stdin, it counts the number of words/strings (separated by default space

+ 5 pts B: Java FOO < data.txt or cat data.txt | java Foo for Windows systems

Question 2

Functions   **25** / 25 pts

2.1   Consider the following method. Which of the following lines of code, if located in the   **5** / 5 pts
       same Java class as calc, will compile without an error?

       ✔ **+ 5 pts** Correct

            + 0 pts Incorrect

2.2   **What output is produced by the following Java program?**   **10** / 10 pts

       ✔ **+ 10 pts** Correct

            10 pts – 1 for breathing - 9
            pts (3 pts for each line of
            output – 1 pt for line being
            partially correct):

            3 5 7
            3 5 7 9
            3 5 7 9 11 13 15

            + 0 pts incorrect

2.3   **What is printed as a result of executing the Java program below.**   **10** / 10 pts

       ✔ **+ 10 pts** Correct

            10 points (2 pt for each
            correct output; ½ point for
            partial correct output)
            2 3 1
            -2 1
            -3 0 1
            4 2
            0

            + 0 pts incorrect

Question 3

Recursion   **32.5** / 35 pts

3.1 ⌐ **Answer the following questions given the recursive method mysteryA**   🚩 **17.5** / 20 pts

    + 0 pts incorrect

    + 20 pts Correct
        A: 22, B: 2, C: computes sum of even values in the array, D:

```java
public static int mysteryA (int[] array, int n) {

    if ( n == 1 ) {
        return array[n-1];
    }
    int value = mysteryA(array, n-1);
    return array[n-1] + value;
}
```

    ✔ **+ 5 pts** A: 22

    ✔ **+ 5 pts** B: 2

    ✔ **+ 5 pts** C: Computes the sum of the even values in the array

    + 5 pts D:

```java
public static int mysteryA (int[] array, int n) {

    if ( n == 1 ) {
        return array[n-1];
    }
    int value = mysteryA(array, n-1);
    return array[n-1] + value;
}
```

    💬 **+ 2.5 pts** Partial Credit: Off by one array index. n=2, sums the first 3.

3.2 ⌐ **Answer the following questions given the recursive method mysteryB.**   **15** / 15 pts

    ✔ **+ 15 pts** Correct
        5, 8, computed the number of odd numbers from 0 to n

    + 0 pts incorrect

    + 5 pts A: 5

    + 5 pts B: 8

    + 5 pts C: Computes the number of odd numbers between 0 and n.

Question 4

OOP Using/Creating Data Types   **20** / 40 pts

4.1 └─ **Create a class called `WordWrapper`**   **20** / 40 pts

> **+ 40 pts** Correct

```java
public class WordWrapper{
    // Class to wrap Strings and perform tasks
    private String theWord;

    // Constructors
    public WordWrapper(String st)
    {
        this.theWord = st;
    }

    // Methods
    // String sandwich upper-lower-upper
    public String sandwich()
    {
        String b = theWord.toUpperCase();
        String s = theWord.toLowerCase();
        String z = b + s + b + "\n";
        return z;
    }
    // isPal - See if word is a palindrome
    public boolean isPal()
    {
        int n = theWord.length();
        for (int i = 0; i < n/2; i++)
        {
            if (theWord.charAt(i) != theWord.charAt(n-1-i)) return false;
        }
        return true;
    }
    // Utility Methods
    public String toString()
    {
        String wordString = (theWord + theWord.length()+ "\n");
        return wordString;
    }
    public static void main(String[] args){
        WordWrapper r = new WordWrapper(args[0]);
        StdOut.print(r);
        StdOut.print(r.sandwich());
        StdOut.print(r.isPal());
    }
}
```

10 points for putting the class together properly (public methods, private vars, constructor first, client test code at the end, testing it properly, etc.)
10 points for the isPal method
10 points for the sandwich method
10 points for overriding toString

> **+ 0 pts** Incorrect

> **+ 10 pts** class set up

> **+ 10 pts** isPal is correct

> ✔ **+ 10 pts** sandwich is correct

> ✔ **+ 10 pts** toString is correct

Q1 Basic Java, Loops & Conditionals, Input and Output
30 Points

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Q1.1 Which of the following statements is NOT true?
2 Points

○ A Java program needs to be compiled before it could be run

○ The compiler translates the program from a high-level language to a low-level language

○ The compiler detects if the program is a Java program with legal syntax)

◉ The compiler detects if the program produces the wrong output.

Q1.2 What is the output of the following code?
2 Points

```java
int a = 2 + 3 * 5 / 2;
double b = a / 5.0;
StdOut.println("b =  " + b );
```

○ This program will not run, because it is illegal to add the number b to the string "b= "

○ b = 2.4;

○ b = 1.1;

◉ b = 1.8;

Q1.3 Suppose myArray is an array of integers. What is the bug in the following code?
2 Points

```
int [] myArray = {2,3,4,5};
for (int i=0 ; i < myArray.length; i++)
    { myArray[i] = myArray[i+1]; }
```

○ myArray.length is not defined

○ myArray[i] = myArray[$i + 1$] makes all elements in the array the same

● It can throw an array index out of bounds exception

○ There is no bug in this code

Q1.4 For the following code assume a and b are 1D arrays with the values: a = [2 4 3 5] and b = [1 2 3]. What is being printed?
4 Points

```
a = b; b = a;
for (int i = 0; i < a.length ; i++)
        StdOut.print(a[i] + "  ");
```

○ it prints 2 4 3 5

● it prints 1 2 3

○ it is an error. We are not allowed to say a=b or b = a

Q1.5 Write the method sameValues(int[][] a, int col) that returns true if there are two elements with the same value on column col. It returns false otherwise.
10 Points

eg. matrix a is the following:

```
1 2 3
3 1 2
2 2 1
```

sameValues(a, 0) returns false
sameValues(a, 1) returns true

```
public static Boolean sameValues(int[][] a, int col) {
    //Write your code here
}
```

```
public static boolean sameValues (int [][] a, int col) {
for (int i = 0; i < a.length - 1; i++) {
int x = a[i][col];

for (int j = i + 1; j < a.length; j++) {
int y = x[i][col];

if (x == y) {
return true;
}
}
}
return false;
}
```

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Q1.6 Consider the following function foo.
10 Points

```java
public static int foo(StdIn input) {

    int x = 0;
    while (!input.isEmpty()) {
        String s = input.readString();
        x++;
    }
    return x;
}
```

a) (5 points) Explain briefly what the function does and what it returns?

The functions counts the number of times a string is inputted by the user and returns an integer value.

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b) (5 points) If the input is coming from a file named *data.txt*, write a single command line to receive the data from the file (instead of stdin). Assume that the function is part of a class file called: *FOO.class*

java FOO < data.txt

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Q2 Functions
25 Points

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Q2.1 Consider the following method. Which of the following lines of code, if located in the same Java class as calc, will compile without an error?
5 Points

```java
public static double calc(int a, double b){
    //implementation not shown
}
```

○ int result = calc(45, 9.0);

○ double result = calc(45.0, 9.0);

○ int result = calc(45.0, 9);

◉ double result = calc(45, 9.0);

Q2.2 What output is produced by the following Java program?
10 Points

```java
public class P2{

    Run | Debug
    public static void main(String[] args){
        odds(3);
        odds(9/2);
        int x = 14;
        odds(20 - x + 1);
    }

    public static void odds(int n){
        for (int i = 1; i <= n; i++){
            int num = 2 * i  + 1;
            System.out.print(num + " ");
        }
        System.out.println();
    }
}
```

```
  3 5 7
  3 5 7 9
  3 5 7 9 11 13 15
```

No files uploaded

Q2.3 What is printed as a result of executing the Java program below.
10 Points

```java
public class P1{
    public static void main(String[] args){
        int x = 1;
        int y = 2;
        int z = 3;
        int a = methodA(x,y,z);
        int b = methodB(a, y);
        System.out.println(a + b);
    }

    public static int methodA(int z, int x, int y){
        System.out.println(x + " " + y + " " + z);
        x = methodB(y, z);
        y = x + y;
        System.out.println(x + " " + y + " " + z);
        return x + y + z;
    }

    public static int methodB(int a, int b){
        a = b - a;
        int x = a - b;
        System.out.println(a + " " + b);
        return x;
    }
}
```

2 3 1
-2 1
-3 0 1
4 2
0

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Q3 Recursion

35 Points

Q3.1 Answer the following questions given the recursive method mysteryA
20 Points

```java
public static int mysteryA (int[] array, int n) {

    if ( n == array.length ) {
        return 0;
    }
    int value = mysteryA(array, n+1);

    if ( array[n] % 2 == 0 ) {
        return array[n] + value;
    } else {
        return value;
    }
}
```

a) (5 points) What is printed when the following code snipped is executed?

```java
int[] a = {6, 12, 4, 7, 1, 5};
System.out.println(mysteryA(a, 0));
```

22

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b) (5 points) What is printed when the following code snipped is executed?

```java
int[] b = {1, 3, 7, 5, 2, 13};
System.out.println(mysteryA(b, 0));
```

2

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c) (5 points) Describe, in a sentence, what mysteryA is computing.

mysteryA computes the sum of the even numbers in an array.

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d) (5 points) Update the mysteryA method to compute the sum of the first n values in the array. Assume the array length is greater than or equal to n, type or upload your updated mysteryA method.

```
public static int mysteryA (int[] array, int n) {
if (n == -1) {
return 0;
}

int value = mysteryA(array, n - 1);
return array[n] + value;
}
```

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Q3.2 Answer the following questions given the recursive method mysteryB.
15 Points

```java
public static int mysteryB (int n) {

    if ( n == 0 ) {
        return 0;
    }
    int value = mysteryB(n-1);

    if ( n % 2 != 0 ) {
        return 1 + value;
    } else {
        return value;
    }
}
```

a) (5 points) What is printed when the following code snipped is executed?

```java
System.out.println(mysteryB(10));
```

5

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b) (5 points) What is printed when the following code snipped is executed?

```java
System.out.println(mysteryB(15));
```

8

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c) (5 points) Describe, in a sentence, what mysteryB is computing.

mysteryB computes the sum of the odd numbers between 0 and n.

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Q4 OOP Using/Creating Data Types
40 Points

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Q4.1 Create a class called `WordWrapper`
40 Points

The class has **one** String instance variable and **four** methods.

1) (10 points) A Constructor `WordWrapper(String input)` that assigns the `input` string to the instance variable.

2) (10 points) A method called `sandwich()` that returns a string consisting of the instance variable string in uppercase, then lowercase, then uppercase again.
For example, if we gave the object has the instance variable string "cat" and we ran the `sandwich()` method, it would return "CATcatCAT".

3) (10 points) A method called `isPal()` that returns true if the instance variable string is palindrome and false if it is not.

4) (10 points) A `toString()` method for this class that returns a string that is the instance variable string with its integer length of
the string concatenated at the end.

For example, if we gave the object has the instance variable string "cat" and we ran the `toString()` method, it would return "cat3".

Include a client (main method) to test the code at the bottom of the class that instantiates an object, calls the `toString()` method to print the object, runs the `sandwich()` method, and then runs the `isPal()` method.
The input string to the object you are instantiating in the client is inputed from the command line.

For example: the output for the strings "dog" and "radar" should run as follows:

```
PS C:\ComputerScience\CS111\Fall2021\Exams\Exam3F21\Code> java WordWrapper dog
dog3
DOGdogDOG
false
PS C:\ComputerScience\CS111\Fall2021\Exams\Exam3F21\Code> java WordWrapper radar
radar5
RADARradarRADAR
true
PS C:\ComputerScience\CS111\Fall2021\Exams\Exam3F21\Code> []
```

Write your code below:

```java
public class WordWrapper {
String word;

public WordWrapper (String input) {
word = input;
}

public String sandwich (String input2) {
return input.toUpperCase() + input.toLowerCase() + input.toUpperCase();
}

public boolean isPal (String input3) {
int x = input.length();
for (int i = 0; i < x/2; i++) {
if (input.charAt(i) == input.charAt(z-i-1)) {
return true;
}
}
return false;
}

public String toString (String input4) {
word = input;
int x = input.length();
return input + x;
}

public static void main (String [] args) {
WordWrapper Palindrome = new WordWrapper("radar");
Palindrome.toString();
System.out.println(Palindrome.sandwich("radar"));
System.out.println(Palindrome.isPal("radar"));
}

}
```