

**Directions: This is a closed book, closed notes examination. Place your answers in the space provided. The point value of each question is indicated. There are a total of 180 points. Your total out of 180 will be weighted to 100 points. You have 2 hours for this examination.**

1. (9 pts) The following program contains syntax errors. Circle each error and clearly correct it.

```
public class LotsOf Errors {  
  
    public static main (String args) {  
        System.out.println("Hello, world!");  
        messwage()  
  
    }  
  
    public static void messwage {  
        System.out.println("This is a program");  
        System.out.print("Syntax errors in it\n");  
    }  
}
```

2. (9 pts) What are the values of *a*, *b*, and *c* after the following code segment executes.

```
int a = 15;  
int b = 10;  
int c = a;  
c -=a;  
a -= b;  
b = b + b;
```

3. (9 pts) What is the output of the following code segment?

```
for (int i = 0; i < 2; i++) {  
    for (int j = 1; j <= 3; j++) {  
        System.out.print("*");  
    }  
    for (int j = 0; j <= i; j++) {  
        System.out.print(j);  
    }  
    System.out.println("*"+i);  
}
```

4. (9 pts) Assuming the following variables have been declared,

```
int a = 14;  
double b = 10.2;  
String str = "Arcturan Monster";
```

Evaluate the following expressions:

a) `Math.pow( a / 3, 3)`

b) `a / 3 + b`

c) `str.substring(str.indexOf("t")+1, str.length())`

5. (9 pts) Write a method named `printString()`. This method takes a `String` and a positive integer as an argument and prints the `String` the given number of times. For example, `printString("abc", 5)` produces:

abcabcabcabcabc

6. (9 pts) Describe a potential problem with the following code:

```
Scanner console = new Scanner(System.in);
System.out.print("What is your favorite color?");
String name = console.next();
if (name == "blue") {
    System.out.println("Mine, too!");
}
```

7. (9) The following code contains logic errors. The method is supposed to return the smallest value of three integers. In what cases does the code return incorrect results?

```
public static int smallestOf3(int n1, int n2, int n3) {
    if (n1 < n2) {
        if (n1 < n3) {
            return n1;
        } else {
            return n3;
        }
    } else {
        if (n2 < n3) {
            return n2;
        } else {
            return n3;
        }
    }
}
```

8. (9) Convert each of the following `for` loops into an equivalent `while` loop.

a) 

```
for (int n = 1; n <= max; n++) {
    System.out.println(n);
}
```

b) 

```
int number = 4;
for (int count = 1; count <= number; count++) {
    System.out.println(number);
    number = number / 2;
}
```

9. (18 pts) Consider the following input file called `fungus.txt`.

```
3.4      7
  dog
    6.7   9   cat
farm     89
```

Now consider the following program. Assume the program is in the same directory as the above file.

```
public class Q9 {

    public static void main (String [] args) throws Exception {
        Scanner s1 = new Scanner(new File("fungus.txt"));
        PrintStream ps = new PrintStream(new File("stuff.txt"));
        String output = foo(s1, ps);
        ps = new PrintStream(new File("fungus.txt"));
        ps.print(output);
    }

    public static String foo (Scanner input, PrintStream output) {
        String other = "";
        while(input.hasNext()) {
            if (input.hasNextDouble())
                output.println(input.nextDouble());
            else
                other = other + input.next() + " ";
        }

        other = other + "\n***\n";
        return other;
    }
}
```

What files exist after this program is run, and what are their contents?

10. (18 pts)

a) What elements does the array `numbers` contain after the following code segment executes?

```
int [] numbers = new int [8];
numbers[1] = 4;
numbers[4] = 6;
numbers[7] = 2;

numbers[numbers[1]]++;
numbers[numbers[4]] = 17;
```

b) Write a code segment that constructs an array of integers of size 100 and fills it with the values 1-100. The first cell of the array (cell 0) should hold 1 and so on.

c) Consider the following code segment:

```
int first = new int[2];
first[0] = 3;
first[1] = 7;
int second = new int[2];
second[0] = 3;
second[1] = 7;

System.out.println(first);

if (first==second)
    System.out.println("Equal");
else
    System.out.println("Not equal");
```

Will this be the output? If not, why not?

```
3 7
Equal
```

11. (9 pts) Consider the following array of integers:

34 17 9 19 23 14 2 7

a) Show the array after *each complete pass* through the array to sort it with insertion sort.

b) Show the array after *each complete pass* through the array to sort it with selection sort.

12. (9 pts) Consider a linear search and a binary search:

a) What are the requirements (in terms of properties of the data to be searched) for each type of search?

b) Which is faster and why?

13. (9 pts) Consider the following method `mystery()`:

```
public static void mystery(int [] a, int [] b) {  
    if (a.length != b.length)  
        return;  
    for (int i = 0; i < a.length; i++)  
        a[i] = a[2 * i % a.length] + b[2 * i % a.length];  
}
```

What are the values in arrays `numbers1` and `numbers2` after the following code executes?

```
int [] numbers1 = {1, 2, 3, 4, 5, 6, 7, 8};  
int [] numbers2 = {2, 4, 6, 8, 10, 12, 14, 16};  
mystery(numbers1, numbers2);
```



14. (9 pts) Write a method `aveLength()`. This method takes an array of `Strings` as an argument and returns the average length of all the `Strings` in the array. For example, if the array of `Strings` is

```
 {"hello", "cat", "bubble" }
```

the average returned would be 4.66666666667.

15. (9 pts) Consider the following class definition:

```
public class Thing {  
  
    private String str;  
    private double num;  
  
    public Thing (String s, double d) {  
        this.str = s;  
        this.num = d;  
    }  
  
    public void setStr (String s) {  
        this.str = s;  
    }  
  
    public String getStr () {  
        return str;  
    }  
}
```

a) Name the data fields of a `Thing` object.

b) Is there a default constructor for `Thing` objects?

c) Name an accessor method for `Thing` objects if there is one. If not, answer "none".



18. (9 pts) Consider the following array:

```
Point [] points = new Point[5];  
points[1] = new Point(2,3);  
points[4] = new Point(0,0);
```

Draw a memory diagram below for the array `points`.