Exam 1 Key

Name: _____

Part 1: Definitions & Short Answer (3 Points Each)

1. What does CPU stand for? Central Processing Unit

2. Explain the difference between high-level languages and machine language. A high-level language is human readable code that is either compiled into machine language or interpreted (or a little of both). A machine language is one in which the computer can run directly.

3. What is the difference between a compiler and an interpreter? A compiler will take a program written in a high-level language, translate it into machine language and then save the machine language program to a file that can be run on the computer. An interpreter does essentially the same thing except that it translates the high-level language to machine language one command at a time and does not save the machine language program to a file.

4. Java is a "platform-independent language." What does this mean? A platform is an operating system, so platform-independent means that the same program can be run on any operating system. Java is compiled into byte code, this byte code is then interpreted by the Java Virtual Machine (JVM). There is a JVM built for every common operating system, so java byte code can be run on any operating system.

5. What is a block statement? A block statement is a segment of code between {}.

6. What are the three types of programming errors? Briefly describe each of them.

    Syntax Error: An error in the program code due to misuse of the programming language.
    Run-time Error: An error that occurs during a run of the program which usually causes the program to terminate prematurely.
    Logic Error: This error occurs when the program is syntactically correct and there are no run-time errors but the program does not do what it was intended to do.

7. What do each of the following do, &&, | |, !, and ^?

    && - Logical and.
    || - Logical or
    ! - Logical not
    ^ - Logical xor

Part 2: Program Traces (15 Points Each)

1. For each of the program inputs below write the output of the program.

```java
import java.util.Scanner;

public class Exam1Trace1 {
    public static void main(String[] args) {
        Scanner keyboard = new Scanner(System.in);
        System.out.print("Input w: ");
        double w = keyboard.nextDouble();
        System.out.print("Input x: ");
        double x = keyboard.nextDouble();
        System.out.print("Input y: ");
        int y = keyboard.nextInt();

        double z = x/4-y/2;
        w += z;
        int m = (int)z;
        int n = (y++) * (--m);

        System.out.println(x + " " + y + " " + z + " " + w + " " + m + " " + n);
    }
}
```

(a)
```
Input w: 3
Input x: 7
Input y: 11

7.0 12 -3.25 -0.25 -4 -44
```

(b)
```
Input w: 4
Input x: 8
Input y: 12

8.0 13 -4.0 0.0 -5 -60
```

(c)
```
Input w: -3
Input x: -5
Input y: -9

-5.0 -8 2.75 -0.25 1 -9
```

2. For each of the program inputs below write the output of the program.

```java
import java.util.Scanner;

public class Exam1Trace2 {
   public static void main(String[] args) {
        Scanner keyboard = new Scanner(System.in);
        System.out.print("Input x: ");
        int x = keyboard.nextInt();
        System.out.print("Input y: ");
        int y = keyboard.nextInt();

        if (x-y > 0){
           System.out.println("Part 1: (x-y > 0)");
        } else if (x-y < -10){
           System.out.println("Part 2: (x-y < -10)");
        } else if (2*x != 4*y){
           System.out.println("Part 3: (2*x != 4*y)");
        } else if (x*x+y*y <= 16){
           System.out.println("Part 4: (x*x+y*y < 16)");
        } else {
           System.out.println("None of the above. ");
        }
   }
}
```

(a)
```
Input x: 55
Input y: 28

Part 1: (x-y > 0)
```

(b)
```
Input x: 1
Input y: 3

Part 3: (2*x != 4*y)
```

(c)
```
Input x: -6
Input y: -3

None of the above.
```

(d)
```
Input x: -2
Input y: -1

Part 4: (x*x+y*y < 16)
```

3. For each of the program inputs below write the output of the program.

```java
import java.util.Scanner;

public class Exam1Trace3 {
    public static void main(String[] args) {
        Scanner keyboard = new Scanner(System.in);
        System.out.print("Input n: ");
        int n = keyboard.nextInt();

        while (n > 0){
            if (n % 5 == 0){
                n = n/5;
            } else if (n % 3 == 0){
                n = n/3;
            } else if (n % 2 == 0){
                n = n/2;
            } else {
                n--;
            }
            System.out.print(n + " ");
        }
    }
}
```

(a)
```
Input n: 19

18 6 2 1 0
```

(b)
```
Input n: 129

43 42 14 7 6 2 1 0
```

(c)
```
Input n: 555

111 37 36 12 4 2 1 0
```

Part 3: Coding (15 Points Each)

1. Write a program that will take in a list of positive integers separated by a space and ending with
   0. The program should find and output the length of the list, the average of the numbers in the
   list, and the minimum and maximum values in the list. The 0 that designates the end of the list
   should not be included in the calculations. If the list is empty the program should print out No
   List. A sample run of the program will produce the following output.

```
Input integer list: 7 4 5 3 6 7 5 4 5 8 9 0
List Length = 11
Average = 5.7272727272727275
Minimum = 3
Maximum = 9
```

```java
import java.util.Scanner;

public class Exam1Code1 {
   public static void main(String[] args) {
      Scanner keyboard = new Scanner(System.in);
      System.out.print("Input integer list: ");

      int count = 0;
      int sum = 0;

      int num = keyboard.nextInt();
      int min = num;
      int max = num;

      while (num != 0) {
         sum += num;
         count++;

         if (num < min)
            min = num;
         if (num > max)
            max = num;

         num = keyboard.nextInt();
      }

      if (count > 0) {
         System.out.println("List Length = " + count);
         System.out.println("Average = " + (1.0 * sum / count));
         System.out.println("Minimum = " + min);
         System.out.println("Maximum = " + max);
      } else
         System.out.println("No List");
   }
}
```

2. In the game of Yahtzee, each player rolls 5 die and within three attempts tries to produce one of the needed configurations of face values. The configuration that earns the most points is the Yahtzee which is when all 5 dice have the same value. It is very uncommon for a player to obtain a Yahtzee in a single roll. Write a program that will simulate rolling 5 die and count the number rolls it takes to get a Yahtzee. A sample run is below.

```
Number of rolls = 4092

public class Exam1Code2 {
   public static void main(String[] args) {

      boolean Yahtzee = false;
      int count = 0;

      while (!Yahtzee) {
         int die1 = (int) (Math.random() * 6) + 1;
         int die2 = (int) (Math.random() * 6) + 1;
         int die3 = (int) (Math.random() * 6) + 1;
         int die4 = (int) (Math.random() * 6) + 1;
         int die5 = (int) (Math.random() * 6) + 1;

         if ((die1 == die2) && (die1 == die3) && (die1 == die4) && (die1 == die5))
            Yahtzee = true;

         count++;
      }
      System.out.println("Number of rolls = " + count);

   }
}
```

3. Write a program that will take an input a String and count the number of vowels and consonants. We will consider y to always be a consonant. A sample run is below.

```
Input the String: This Is A TesT of the CHARacter COunts
Vowels = 11
Consonants = 20
```

```java
import java.util.Scanner;

public class Exam1Code3 {
    public static void main(String[] args) {
        Scanner keyboard = new Scanner(System.in);
        System.out.print("Input the String: ");
        String str = keyboard.nextLine();

        str = str.toLowerCase();
        int vcount = 0;
        int ccount = 0;

        for (int i = 0; i < str.length(); i++) {
            char testchar = str.charAt(i);
            if ((testchar >= 'a') && (testchar <= 'z'))
            {
                if ((testchar == 'a') || (testchar == 'e') || (testchar == 'i')
                    || (testchar == 'o') || (testchar == 'u')){
                    vcount++;
                }
                else{
                    ccount++;
                }
            }
        }

        System.out.println("Vowels = " + vcount);
        System.out.println("Consonants = " + ccount);

    }
}
```