Name: _____

Write all of your responses on these exam pages.

1 Short Answer (5 Points Each)

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

2. Write a single line of code that declares an integer variable `num1` and assigns to it a random integer between 25 and 41, inclusively.

3. Write a few lines of code that will take a string stored in `str1`, extract the last word and then convert that word to all lowercase characters and finally print the word out to the screen.

4. Answer the following questions about numeric data types in Java.

   (a) What happens when you overload an int?

   (b) What happens when you overload a double?

   (c) What happens when you underload an int?

   (d) What happens when you underload a double?

   (e) What happens when you input a double when the Scanner is doing a nextInt?

2 Program Traces (15 Points Each)

1. For each of the given inputs, write the output of the program.

```
1  import java.util.Scanner;
2
3  public class Exam01Trace01 {
4
5      public static void main(String[] args) {
6          Scanner kb = new Scanner(System.in);
7          System.out.print("Input a positive number: ");
8          int n = kb.nextInt();
9          String s = "";
10
11         while (n > 0) {
12             int r = n % 2;
13             n = n / 2;
14             s = r + s;
15         }
16         System.out.println(s);
17     }
18 }
```

(a) `Input a positive number: 9`

(b) `Input a positive number: 19`

(c) `Input a positive number: 35`

2. For each of the given inputs, write the output of the program.

```
1  import java.util.Scanner;
2
3  public class Exam01Trace02 {
4
5      public static void main(String[] args) {
6          Scanner kb = new Scanner(System.in);
7          System.out.print("Input n: ");
8          int n = kb.nextInt();
9          System.out.print("Input m: ");
10         int m = kb.nextInt();
11         System.out.print("Input t: ");
12         int t = kb.nextInt();
13
14         System.out.println("Start: " + n + "  " + m + "  " + t);
15
16         do {
17             if (n > t) {
18                 System.out.print("One: ");
19                 t = t + m - n;
20                 m++;
21             } else if (n < t / 2) {
22                 System.out.print("Two: ");
23                 m--;
24                 t++;
25             } else {
26                 System.out.print("Three: ");
27                 m = t++;
28             }
29
30             System.out.println(n + "  " + m + "  " + t);
31             n -= 2;
32         } while (n > 0);
33     }
34 }
```

(a) `Input n: 3`
`Input m: 5`
`Input t: 9`

(b) `Input n: 4`
`Input m: 4`
`Input t: 3`

(c) `Input n: 12`
`Input m: 15`
`Input t: 10`

3. For each of the given inputs, write the output of the program.

```
1  import java.util.Scanner;
2
3  public class Exam01Trace03 {
4
5      public static void main(String[] args) {
6          Scanner kb = new Scanner(System.in);
7          System.out.print("Input str1: ");
8          String str1 = kb.nextLine();
9          System.out.print("Input str2: ");
10         String str2 = kb.nextLine();
11         System.out.print("Input str3: ");
12         String str3 = kb.nextLine();
13
14         int pos = 1;
15         while (str2.length() > 0) {
16             String str4 = str2.substring(0, 1);
17
18             str1 = str1.replaceAll(str4, str3);
19             System.out.println(str1 + " : " + str2);
20
21             if (pos < str2.length())
22                 str2 = str2.substring(pos);
23             else
24                 str2 = "";
25
26             pos++;
27         }
28     }
29 }
```

(a)
```
Input str1: love all, trust a few, do wrong to none.
Input str2: william
Input str3: S
```

(b)
```
Input str1: you can't blame gravity for falling in love.
Input str2: albert
Input str3: E
```

3 Coding (15 Points Each)

1. Write a program that will simulate rolling two die and count the number rolls it takes to get two consecutive rolls of boxcars (two sixes).

```
import java.util.Scanner;

public class Exam01_1 {

    public static void main(String[] args) {
        Scanner keyboard = new Scanner(System.in);









    }
}
```

2. The double factorial of a positive integer n is defined to be $n!! = n \cdot (n-2) \cdot (n-4) \cdots 1$, also we define $0!! = 1$. Write a program that will allow the user to input an integer n and then the program should output the value $n!!$. If the user inputs a negative number the program should print out an error message saying that the input was invalid.

```
import java.util.Scanner;

public class Exam01_2 {

    public static void main(String[] args) {
        Scanner keyboard = new Scanner(System.in);









    }
}
```

3. Write a program that will take an input string from the user and a character from the user and output the number of occurrences of that character in the string. The counting must be case insensitive, that is `A` and `a` are both counted when searching for an `a`. A sample run is below. Note that Java does not have a function for the scanner that reads in a single char, input a string and extract the first character.

```
String: This is a test of The character counTer.
Character: t
Count = 6
```

```
import java.util.Scanner;

public class Exam01_3 {

    public static void main(String[] args) {
        Scanner keyboard = new Scanner(System.in);

    }
}
```