1 Short Answer (5 Points Each)

1. Write a single line of code that declares an integer variable `n` and assigns to it a random integer between −10 and 10, inclusively.

   Solution:

   ```
   int num1 = (int) (Math.random() * 21) - 10;
   ```

2. Write a single line of code that declares a string variable called `str1` and stores in it your name.

   Solution:

   ```
   String str1 = "Don Spickler";
   ```

3. What does ASCII stand for and what is it?

   Solution:

   American Standard Code for Information Interchange. It is a system where characters are associated with numbers.

4. Which of the following are valid variable names. If the variable name is invalid state why.

   (a) `hciaHUihlHU`
   Solution: Valid

   (b) `Item17`
   Solution: Valid

   (c) `if`
   Solution: Invalid: Variable name cannot be a reserved word.

   (d) `Oh&My`
   Solution: Invalid: Variable name cannot have a space or special character.

   (e) `53cookies`
   Solution: Invalid: Variable name cannot begin with a number.

5. What is the difference between a compiler and an interpreter? Also, discuss Java's method.

   Solution: 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. Java uses a combination of the two. There is a compile stage that translates the Java code into byte-code that the interpreter (known as the JVM or Java Virtual Machine) runs.

6. Java is a "platform-independent language." What is a *platform*, what does *platform-independent* mean, and how does Java attain its platform independence?

   Solution: 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.

2 Program Traces (20 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 keyboard = new Scanner(System.in);
7
8          System.out.print("Number 1: ");
9          int a = keyboard.nextInt();
10         System.out.print("Number 2: ");
11         int b = keyboard.nextInt();
12         System.out.print("Number 3: ");
13         int c = keyboard.nextInt();
14
15         int x = a;
16         int y = b;
17         int z = c;
18
19         int w = a / b;
20         int t = a % b;
21         System.out.println(x + " " + y + " " + z);
22         System.out.println(w + " " + t);
23
24         z = x;
25         x = y;
26         y = z;
27         w = x++;
28         t = --y;
29
30         System.out.println(x + " " + y + " " + z);
31         System.out.println(w + " " + t);
32
33         x = a;
34         y = b;
35         z = c;
36         z += x;
37         y *= 3;
38
39         System.out.println(x + " " + y + " " + z);
40         System.out.println(w + " " + t);
41
42         x = a;
43         y = b;
44         z = c;
45
46         w = 2 * x + 3 * (z + y);
47         double d = Math.pow(x, 2) + Math.pow(y, 2);
48
49         System.out.println(x + " " + y + " " + z);
50         System.out.println(w + " " + d);
51
52         d = a / 4.0;
53         System.out.print(d + " ");
54         System.out.print(Math.round(d) + " ");
55         System.out.println((int) d);
56     }
57 }
```

(a)
```
Number 1: 7
Number 2: 5
Number 3: 3
```
Solution:
```
7 5 3
1 2
6 6 7
5 6
7 15 10
5 6
7 5 3
38 74.0
1.75 2 1
```

(b)
```
Number 1: 13
Number 2: 4
Number 3: 7
```
Solution:
```
13 4 7
3 1
5 12 13
4 12
13 12 20
4 12
13 4 7
59 185.0
3.25 3 3
```

2. For the given input, write the output of the program. For any spaces, including leading or trailing, use an under bracket to represent the space. For example, `Hi  There ` should be written as `Hi␣␣There␣`.

```
1  import java.util.Scanner;
2
3  public class Exam01Trace02 {
4
5      public static void main(String[] args) {
6          Scanner keyboard = new Scanner(System.in);
7
8          System.out.print("String 1: ");
9          String a = keyboard.nextLine();
10         System.out.print("String 2: ");
11         String b = keyboard.nextLine();
12         System.out.print("String 3: ");
13         String c = keyboard.nextLine();
14
15         int n = a.indexOf(b);
16         int m = a.indexOf(c);
17         int p = b.indexOf(c);
18         int q = a.lastIndexOf(b);
19
20         System.out.println(a.length());
21
22         System.out.print(n + " " + m + " ");
23         System.out.println(p + " " + q);
24         String x = a.substring(n, m);
25         System.out.println(x);
26
27         x = a.substring(n);
28         System.out.println(x);
29
30         x = a.substring(n, q);
31         System.out.println(x);
32
33         System.out.println(a.endsWith("icky"));
34
35         x = a + " " + c;
36         System.out.println(x);
37         System.out.println(a.toUpperCase());
38         System.out.println(a);
39
40         System.out.println(a.charAt(5));
41     }
42 }
```

```
String␣1:␣This␣is␣tricky
String␣2:␣is
String␣3:␣rick
```

Solution:

```
14
2␣9␣-1␣5
is␣is␣t
is␣is␣tricky
is␣
true
This␣is␣tricky␣rick
THIS␣IS␣TRICKY
This␣is␣tricky
i
```

3 Coding (20 Points Each)

1. In the game of Fizzbin one player rolls two fair 6 sided die. If the first roll results in the same number on both die the player loses. If the two die have different numbers on them then the player gets a second roll. If on the second role the sum of the values of the die are odd then the player wins but if the sum of the values of the die are even the player loses. Write a program that will play the game of Fizzbin. Three example runs are below.

```
First Roll: 2 3
Second Roll: 3 4
You win!
```

```
First Roll: 5 2
Second Roll: 5 3
You lose!
```

```
First Roll: 3 3
You lose!
```

Solution:

```java
public class Exam01Prog01 {

    public static void main(String[] args) {
        int die1 = (int) (Math.random() * 6) + 1;
        int die2 = (int) (Math.random() * 6) + 1;

        System.out.println("First Roll: " + die1 + " " + die2);

        if (die1 == die2)
            System.out.println("You lose!");
        else {
            die1 = (int) (Math.random() * 6) + 1;
            die2 = (int) (Math.random() * 6) + 1;

            System.out.println("Second Roll: " + die1 + " " + die2);

            if ((die1 + die2) % 2 == 1)
                System.out.println("You win!");
            else
                System.out.println("You lose!");
        }
    }
}
```

2. Write a program that will ask the user to input their name on a single line in informal style (e.g. John Doe), and their year of birth (in yyyy format, such as 1985). The program should print out the users formal name (e.g. Doe, John). It should then determine where in the alphabet their last name belongs, either the first half or the second half. If their last name begins with A–M then their name is in the first half and if it begins with N–Z it is in the second half. The program should calculate their age and then print it out. Then if the user's age is less than or equal to 12 print out "You are just a kid.", if the user's age is greater than 12 but less than 20 then print out "You are a teenager.", if the user's age is greater than or equal to 20 but less than 40 then print out "You are getting up there.", and finally if the user's age is greater than or equal to 40 print out "Man, you are old!". Two sample runs are below,

```
Input your name in informal form: Don Spickler
What year were you born: 1965
Your formal name is: Spickler, Don
Your name is in the second half of the alphabet.
Your age: 53
Man, you are old.
```

```
Input your name in informal form: John Doe
What year were you born: 1999
Your formal name is: Doe, John
Your name is in the first half of the alphabet.
Your age: 19
You are a teenager.
```

Solution:

```
1  import java.util.Scanner;
2
3  public class Exam01Prog02 {
4
5      public static void main(String[] args) {
6          Scanner keyboard = new Scanner(System.in);
7
8          System.out.print("Input your name in informal form: ");
9          String first = keyboard.next();
10         String last = keyboard.next();
11         System.out.print("What year were you born: ");
12         int year = keyboard.nextInt();
13
14         System.out.println("Your formal name is: " + last + ", " + first);
15
16         char lastinitial = last.toLowerCase().charAt(0);
17
18         if (lastinitial <= 'm')
19             System.out.println("Your name is in the first half of the alphabet.");
20         else
21             System.out.println("Your name is in the second half of the alphabet.");
22
23         int age = 2018 - year;
24         System.out.println("Your age: " + age);
25
26         if (age <= 12)
27             System.out.println("You are just a kid.");
28         else if (age < 20)
29             System.out.println("You are a teenager.");
30         else if (age < 40)
31             System.out.println("You are getting up there.");
32         else
33             System.out.println("Man, you are old.");
34     }
35 }
```