Programming 1

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Notice: Your ID and name should be printed before the outputs of all programs.

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1. Write a program that calculates the area of circle using it's radius. The following is an example.

   Please enter the radius of a circle: 19

   Area of a circle is 1134.114947

2. Write a program that generates the factorial of a given number. You can use a recursive function. The following is an example.

   Enter the number: 5

   Factorial of the number is: 120

3. Write a program that sorts five numbers. You can use any sorting algorithm you know, but you should explain your algorithm briefly in your report. The following is an example.

   Enter five numbers: 34 51 20 19 85

   Sorted numbers: 19 20 34 51 85

4. Write a program that simulates rolling a pair of dice. You can simulate rolling one die by choosing one of the integers 1, 2, 3, 4, 5, or 6 at random. The number you pick represents the number on the die after it is rolled. The expression

   (int)(Math.random()*6) + 1

   does the computation you need to select a random integer between 1

and 6. You can assign this value to a variable to represent one of the dice that are being rolled. Do this twice and add the results together to get the total roll. Your program should report the number showing on each die as well as the total roll. For example:

The first die comes up 3

The second die comes up 5

Your total roll is 8

5. How many times do you have to roll a pair of dice before they come up snake eyes? You could do the experiment by rolling the dice by hand. Write a computer program that simulates the experiment. The program should report the number of rolls that it makes before the dice come up snake eyes. (Note: "Snake eyes" means that both dice show a value of 1.)

6. In the following PairOfDice class, the instance variables die1 and die2 are declared to be public. They really should be private, so that they would be protected from being changed from outside the class. Write another version of the PairOfDice class in which the instance variables die1 and die2 are private. Your class will need "getter" methods that can be used to find out the values of die1 and die2. (The idea is to protect their values from being changed from outside the class, but still to allow the values to be read.) Include other improvements in the class, if you can think of any. Test your class with a short program that counts how many times a pair of dice is rolled, before the total of the two dice is equal to two.

```
public class PairOfDice {

    public int die1;    // Number showing on the first die.

    public int die2;    // Number showing on the second die.
```

```
    /**
     * Constructor creates a pair of dice and rolls them so that
     * they initially show some random value.
     */
    public PairOfDice() {
        roll();  // Call the roll() method to roll the dice.
    }

    /**
     * Roll the dice by setting each die to be a random number between
1 and 6.
     */
    public void roll() {
        die1 = (int)(Math.random()*6) + 1;
        die2 = (int)(Math.random()*6) + 1;
    }

} // end class PairOfDice
```

7. Write a program that asks the user's name, and then greets the user by name. Before outputting the user's name, convert it to upper case letters. For example, if the user's name is Fred, then the program should respond "Hello, FRED, nice to meet you!".