CS 102 – Computing and Algorithms II

Homework 2

1) (10 points) Explain what is meant by the following terms:

    a. Static storage allocation
    b. Dynamic storage allocation
    c. Activation record
    d. Tail recursion

2) (30 points) The "sum of powers of two" is the sum of the first n+1 powers of $(2^0 + 2^1 + 2^2 + \cdots + 2^{n-1} + 2^n)$:

$$P(n) = 2^0 + 2^1 + 2^2 + \cdots + 2^{n-1} + 2^n = \sum_{k=0}^{n} 2^k = 2^{n+1} - 1$$

Consider the following method "sumOfPowers" to compute P(n) for any n ≥ 0:

public int sumOfPowers(int n) { ... }

- The method above should return a special value (-1) whenever the input is invalid (n < 0).
- Don't use the "pow" function in java. You can only use multiplications to compute the powers.

1. Develop an iterative implementation of "sumOfPowers".

2. Write a complete recursive definition to compute P(n) recursively.

3. Develop a recursive implementation of "sumOfPowers", using your definition for (b).

Style

Use white space (Indentation, blank lines) to show the program structure. A meaningful class name is an important part of the style. If should describe the purpose of the class. A meaningful name will be supplied as part of the design. Likewise, all variable and constant names will be meaningful and will follow naming conventions.

On top of each program should have the following comments:

```
/*
 * Name:
```

```
     * Date:
     * Question number:
     * Description:
*/
```

Deliverables

You will create a .java file for each of the programming questions and compressed them all in a zip file with your lastname and homework number (Lastname_HW2) and submit the zip file on Blackboard and present to the instructor before the due date. After submitting your homework on blackboard, send me an email with the subject **CS102_Lab_Section A** or **CS102_Lab_Section B** to setup a Demo meeting.

Grading

The homework will be worth 40 points. If your program does not compile, the grade for that question will be 0. If your program compiles but does not produce the correct output, the score will be at most 5 points, depending on how close the solution is to being correct.

Late submitted and presented assignments will be assessed a 3% penalty (-3 points) for each day of delay.

This is an individual assignment. Working together on a homework assignment is not permitted. Having someone not in the course write the program for you is not permitted. If another student asks for help, the most assistance you should offer is to aid him/her in the discovery of the error. You should not help correct the error. It is also your responsibility to ensure that no one else turns in your work as his or her own. All suspected cases of academic dishonesty would be handled in strict accordance with department and university policy.