CSCI 2170   Open Lab Assignment 3
Program Due: (23:59, Tuesday, March 5th, 2013)

This lab is designed to address the <u>recursion</u> concept.
Problem Statement: Write a program that performs following functionalities in **<u>recursion</u>**.
Your program should contain following functions:

1. **fibonacci**: a recursive function that computes the fibonacci series, which is defined as follows
    fibonacci (n) = fibonacci(n-2) + fibonacci(n-1)
    fibonacci(0) = 0
    fibonacci(1) = 1
    So the fibonacci looks like: 0 1 1 2 3 5 8 13 21 34 …. Therefore, fibonacci(4) = 3, fibonacci(5) = 5, fibonacci(7)=13

2. **power:** a recursive function that takes two integer parameters and returns x^y. Assuming x is nonzero,
power(x,y) =	*1*	*if y = 0*
	x *power(x, y-1)	*if y > 0*
	1/ x^{-y}	*if y < 0*

3. **greatestCommonDivisor:** a recursive function that computes the greatest common divisor of two positive integers.

    The greatest common divisor of two non-zero integers, is the largest positive integer that divides both numbers without remainder.

gcd(x,y) =	*x*	*if y = 0*
	gcd(y, x mod y)	*if x>=y and y > 0*

    For example, gcd(5, 0) is 5, gcd(18, 12) is 6 and gcd(56, 42) is 14.

4. **Find and erase eagle:** Write a program that examines and counts the number of objects (eagles) in a photograph. The data is in a two-dimensional grid of cells, each of which may be empty (value 0) or filled (value 1 to 9). Maximum grid size is 50 x 50. The filled cells that are connected form an object (eagle). Two cells are connected if they are connected vertically or horizontally. The following figure shows 3 x 4 grids with 3 eagles.

    0 0 1 2
    1 0 0 0
    1 0 3 1

    Your program should include one **recursive** function: **Find2EraseEagle.**

    Find2EraseEagle function takes as parameters the 2-D array and the x-y coordinates of a cell that is a part of an eagle (non-zero value) and erases (change to 0) the image of an eagle. The function Find2EraseEagle should return an integer value that counts how many cell has been erased.

    There should be other functions to complete the program.

Read input from the data file "data.txt"
The following sample data has two pictures, the first one is 3 x 4, and the second one is 5 x 5
grids. Note that your program should be able to handle any number of pictures that are contained
in the data file.
Print out the picture of the photograph, and number of eagles found in each picture. As the
program discovers each eagle, it should also print the size of the eagle just found. Process all the
pictures in the file.

Sample input:
3 4
0 0 1 2
1 0 0 0
1 0 5 1
5 5
0 0 0 1 1
0 1 8 1 9
0 0 0 0 0
1 0 0 2 1
1 3 1 9 1

Sample output:
0 0 1 2
1 0 0 0
1 0 5 1

An eagle size 2 is found and erased.
An eagle size 2 is found and erased.
An eagle size 2 is found and erased.

3 eagle(s) found in the picture.

0 0 0 1 1
0 1 8 1 9
0 0 0 0 0
1 0 0 2 1
1 3 1 9 1

An eagle size 6 is found and erased.
An eagle size 8 is found and erased.

2 eagle(s) found in the picture.

Requirement:
- Your program should provide a menu as follows:

Which function would you like to use?   Type a number.
1. Fibonacci series
2. Power
3. Greatest Common Divisor
4. Find and Erase Eagle
5. Exit

- When the user selects a choice, your program should prompt for input if necessary and perform the appropriate function or terminate the program. The result should be printed with an appropriate heading.
- Assume that user always input valid values.

Peer Code Review:
1. The required comments at the beginning of each source file must start with four slashes "////". Otherwise, the assigned code reviewer may see your identification. The following is an example:
    //// Author: Your name here
    //// Date: March 5th, 2013
    //// Purpose: develop an interactive program to practice programming in recursion
2. **Failure to submit the OLA will prevent you from performing peer code review.**
3. You are required to submit your executable file. If you cannot generate the executable file because of compiler errors, please submit an executable to print the message "My submission contains compiler errors." This will save reviewer's time.

How to submit the program
- **softcopy:** Login to PeerSpace, click *tools|Assignments* to submit your softcopy
- **Hard copy:**
    - Enclose the following in a folder (at least 9"x12"), and put user id (the one I give you), your name, section #, instructor name on the folder.
    - hard copy of the program: **lph ola3.cpp**