COE202/DGD 104 – Homework 1

In this homework, you will use basic control structures of C++ combined into a single program. Please, follow the directions to create this program in detail.

The structure of the program is as follows. It first prints out a message on the screen asking the user to select 3 choices for implementing certain tasks:

```
Welcome to my first C++ program!
Please select a task to perform (-1 to exit):
1) Draw a pyramid
2) Draw a star
3) Compute the Fibonacci numbers
```

If the user enters an invalid value (not an integer between 1 and 3, or some other character), the program should message that the entered value is not valid and keep presenting the menu as follows, but without giving the Welcome message above:

```
You have entered an invalid value for selection.
Please select a task to perform (-1 to exit):
1) Draw a pyramid
2) Draw a star
3) Compute the Fibonacci numbers
```

The program continues as follows upon a valid selection of the user.

1) If 1 is selected, it asks the user the height of the pyramid on a new line:

```
Please enter the height of the pyramid (between 1 and 40):
```

If the user enters an invalid value (not an integer between 1 and 40), the program should message that the entered value is not valid and keep asking the question:

```
You have entered an invalid value for height.
Please enter the height of the pyramid (between 1 and 40):
```

If the value is valid, the program will draw a pyramid of asterisks with the base length entered by the user. The leftmost asterisk at the base will be the starting point of the new line. Each horizontal level of the pyramid contains an odd number of asterisks, starting from 1 at the top, and proceeding as 3, 5, ..., 2n-1, where n is the height. For example, for height 4, the output would be 4 levels of stars with 1, 3, 5, 7 asterisks at each level as follows:

```
   *
  ***
 *****
*******
```

2) If 2 is selected, it asks the user the size of the star on a new line:

```
Please enter the size of the star (between 1 and 20):
```

If the user enters an invalid value (not an integer between 1 and 20), the program should message that the entered value is not valid and keep asking the question:

```
You have entered an invalid value for size.
Please enter the size of the star (between 1 and 20):
```

If the value is valid, the program will draw a certain type of star composed of asterisks with height 2n+1, where n is the size entered by the user. The star consists of a union of two sequence of diagonal asterisks of size 2n+1. The leftmost asterisk in both of the diagonals will be the starting point of the new line. For example, for size 3, the output would be 7 levels of asterisks arranged as follows:

```
*      *
 *    *
  * *
   *
  * *
 *    *
*      *
```

3) If 3 is selected, the user is asked the index (a non-negative integer value) of the Fibonacci sequence to be computed.

```
Please enter the index of the Fibonacci number to be computed:
```

If the user enters an invalid value (not an integer greater than or equal to 0), the program should message that the entered value is not valid and keep asking the question:

```
You have entered an invalid value for index.
Please enter the index of the Fibonacci number to be computed:
```

If the value is valid, the program will compute the Fibonacci number F(n), where n is the index entered by the user. Fibonacci sequence is defined as follows.

F(0) = 0,
F(1) = 1,
F(n) = F(n-1) + F(n-2) for n >= 2.

Thus, the first few numbers of the sequence are 0, 1, 1, 2, 3, 5, 8, 13, 21, ...
Given this, if n = 5, the answer is 5. If n = 8, the answer is 21.

IMPORTANT NOTE: You should NOT use arrays in implementing this part (if you know arrays at all). Instead, use only a loop with appropriate variables. Besides, you cannot compute the Fibonacci numbers for arbitrarily large integers because this would cause arithmetic overflow. Determine the largest index for which your program can compute the Fibonacci number, and write it as a comment in your code.

ANOTHER IMPORTANT NOTE: After your program performs one of the 3 tasks described above, it should continue presenting the main menu until -1 is entered by the user:

```
Please select a task number to perform (-1 to exit):
1) Draw a pyramid
2) Draw a star
3) Compute the Fibonacci numbers
```

If -1 is entered by the user, the program exits.

Important Submission Instructions: Zip the whole Code Blocks folder into a single zip file named “COE202-HW 1-Name-Second Name” or “DGD104-HW 1-Name-Second Name” according to your section without the quotation marks. The due time is 23:59 on March 28, Sunday. Any deviations from these guidelines might result in a grade 0.

EXTREMELY IMPORTANT about cheating and plagiarism: Do not show your code to someone else, and do not ask someone else to show his/her code to you. I can easily detect if you have cheated by a simple software. If a certain similarity threshold is exceeded, both sides will get 0 from the homework. I did this in the past. And the students did not have a chance to defend themselves. You can call your friends and ask rough questions about the homework. But you should be doing the coding YOURSELF. This is the real opportunity to learn.