CSCI 2500 — Computer Organization
Lab 01 (document version 1.0)

- This lab is due by the end of your lab session on Wednesday, September 1, 2021.
- This lab is to be completed **individually**. Do not share your code with anyone else.
- You **must** show your code and your solutions to a TA or mentor to receive credit for each checkpoint.
- Labs are available on Mondays before your lab session. Plan to start each lab early and ask questions during office hours, in the Discussion Forum on Submitty, and during your lab session.

1. **Checkpoint 1:** Write a C program that asks the user for a positive integer n, then builds a *right triangle* as shown in the example below. Implement this using nested `for` loops.

```
What is n? 4
*******
*****
***
*
```

   If you did not do so in the first place, write a function to build this triangle. Next, write another function to accomplish the same result, but use `printf()` to achieve the formatting using at most one loop. Hint: look at the functions contained within the header `string.h` for inspiration.

   Given the previous problem, you next will have your program calculate the hypotenuse (https://mathworld.wolfram.com/Hypotenuse.html). Assume the triangle is a right triangle with the given height of n and a length equal to the number of stars used on the base of the triangle. Use `printf()` to display exactly **two digits** of precision past the decimal point for a `float`.

```
What is n? 3
*****
***
*
Length of hypotenuse: 5.83
```

2. **Checkpoint 2:** The Fibonacci sequence (https://mathworld.wolfram.com/FibonacciNumber.html) is calculated recursively by summing the previous two values of the sequence, i.e., `fib(n) = fib(n - 1) + fib(n - 2)`. Assume that this sequence starts with `fib(0) == 0` and `fib(1) == 1` as its first two elements.

   Add on to your program (using `long` and not `int` for `fib`) that asks the user for a non-negative integer, then computes its Fibonacci number using a recursive function.

```
What is n? 12
**********************
*********************
*******************
*****************
***************
*************
***********
*********
*******
*****
***
*
Length of hypotenuse: 25.94
What is n? 15
Fibonacci: 610
```

Run your program on larger and larger numbers. Does it take longer to compute? Is there any way to speed this computation up and keep the recursion? Can you speed this computation up by removing the recursion – e.g., by making the computation iterative? Support your answer by writing and presenting an iterative solution.