CECS 282 - Homework 2

Complete these problems on a separate sheet of paper. You may attach a printout of any code you write.
Due date: February 5

1. Reading from *C++ How to Program*:

    (a) *Skim* Chapter 6.1 and 6.2

    (b) *Review* Figure 6.2 in Chapter 6.3

    (c) Chapter 6.5 (including Figure 6.6)

    (d) Chapter 6.6 (don't need to memorize, just a good reference)

    (e) Chapter 6.12 (note that the book draws each activation record differently than us – we will draw a record with the *return value* on bottom, we will not show *return location* [but you should understand that it is still recorded by the computer], then *function parameters*, and then *local variables* at the top of the record.)

    (f) Chapter 6.14

    (g) Chapter 6.18

2. The following code does not compile, citing an error of "identifier Funk is undefined." Show/explain with code how to resolve the compile-time error.

   ```
   int main() {
       // call Funk #49
       Funk(49);
   }

   void Funk(int f) {
       f = f * 2;
   }
   ```

3. Write a C++ function `RoundToNearest`, which takes a positive `double` parameter and returns the integer nearest that double by rounding it. (Example: `RoundToNearest(6.4) = 6`, `RoundToNearest(6.5) = 7`.) Write your function using **only a single line of code in the function body**, and **without** using any rounding functions from the C++ standard library. (Your code should not call any functions at all and should consist entirely of arithmetic.)

4. Write a C++ function `gcd`, which takes two integers and calculates the *greatest common denominator* of the two integers. Implement the function **recursively** (WITHOUT LOOPS) using the "Euclidian algorithm", which says that the `gcd` of two integers `x` and `y` is (with $x > y$):

$$\gcd(x, y) = \begin{cases} x & \text{if } y = 0 \\ \gcd(y, \text{remainder}(x, y)) & \text{if } y > 0 \end{cases}$$

   where $\text{remainder}(x, y)$ gives the integer remainder when x is divided by y. Using your code, what is `gcd(259, 111)`?

5. Draw a stack frame / activation record for the following C++ function. Follow our standard: from top to bottom, reserve space for the function's return value, parameters (in "bottom-up" order), and local variables (also in "bottom-up" order). Arrays should be drawn vertically with index 0 at the "top" of the array.

   ```
   double SomeFunction(int x, char y) {
      long long local1;
      bool local2[4];
      short local3;
      return 0; // for correctness, but irrelevant to your answer
   }
   ```

6. Ada downloads the file `mymath.h` from the Lecture 2 and saves it to her Desktop on her Windows PC. She then sets up a C++ project in Visual Studio and notes that Visual Studio saved the project on her hard drive at the location `C:\AdaProjects\Question5`. She adds `mymath.h` to her project by using the "Add Existing Item" option in Visual Studio; this option references the file `mymath.h` in the project, but does not copy it to the project folder.

She adds a new file to the project called `main.cpp`, and notes that Visual Studio puts the new file in the folder `C:\AdaProjects\Question5`. She writes this code in `main.cpp`:

```
#include <iostream>
#include "mymath.h"

int main(int argc, char* argv[]) {
   // call Pow from mymath.h
   int p = Pow(2, 5);
}
```

When Ada compiles her file, she gets the following error message: `Could not open include file: 'mymath.h':  No such file or directory`

(a) Where is the compiler looking for the file `iostream`? (You will need to research this.)

(b) Where is the compiler looking for the file `mymath.h`?

(c) Why can't the compiler locate `mymath.h`?

(d) What's the moral of the story here?

7. In your own words, define:

(a) what the `inline` keyword does;

(b) what *function overloading* means.