Assignment #1: Magic Square **Due:** Wed. Sept. 6th **(midnight)**

Program files:

Code: magic_square.cpp
Output: a1.txt

Objective:

For this assignment you will create a C++ program that will utilize a two dimensional array to determine if a 3 x 3 array represents a magic square. A magic square is a 3 x 3 grid in which each row, each column, and each diagonal add up to the same number. For example:

4	9	2
3	5	7
8	1	6

Each of the rows in the above grid add up to 15. Each column adds up to 15. In addition, each diagonal adds up to 15. Therefore, it represents a magic square.

Program Overview:

This program will use a two-dimensional array to represent a "magic Square". Your magic square will be represented in the program as a 2D array of integers. The data for the magic square will be input by the user from the keyboard. The array will be filled in a row/column fashion.

Program Requirements:

First, your program may NOT contain any global variables. Main() will be responsible for calling functions. Therefore, main() will be a series of function calls along with any necessary variable declarations you will need for you program.

Function Prototypes and Descriptions:

- **void loadSquare(int square[3][3]);**
  - This function will receive the empty two-dimensional array and load it with data. The function will prompt the user to enter 9 integers one at a time, telling the user which value they are entering, ("Entering row 1, column 1:), until all values have been entered.

- **bool isMagic(int square[3][3]);**
  - This function will receive the 2-D array and determine if it is a magic square. You will need to declare/define a few local variables to help you. You will definitely need a Boolean which will act as the return value for the function.
  - You will need to figure out the logic of traversing the array. Remember, all rows, columns and each diagonal must all equal the same number. So, you may want to first determine what the first row equals and make that the value you are looking for.

- **main()**
  - Your main() function should perform the following tasks:
  - Declare/define all necessary variables (array, etc.)
  - Declare/define:
    - the two-dimensional array **int square[3][3]**
  - Call the **loadSquare** function
  - Call the **isMagic** function and accept the return value
  - Send the program output to an external file named, **a1.txt**

Program Output:
The output of your program will go to an external file, NOT to the console. You will need to include a new preprocessor directive so you may work with files. Include the following at the top of your program:

```
#include<fstream>
```

By including fstream you will have the ability to read and write from external files. At this point in time, these files will be **text** files.

We will review how to write to files in class. Refer to your class notes.

The output for this program will appear in a text file named, **a1.txt.** The data in the file should look like the following.

Please run your program **three times.** You will use the following sets (3)t of data:

1st run:
4 9 2
3 5 7
8 1 6

2nd run
9 1 1
4 2 3
9 3 3

3rd run:
2 7 6
9 5 1
4 3 8

Although the following do not reflect the values you will run, your output should be formatted in this manner.

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

PROGRAM RESULTS:

4|9|2|
3|5|7|
8|1|6|
The values you entered represent a magic square!

PROGRAM RESULTS:

2|1|3|
3|4|1|
5|3|2|
The values you entered do not represent a magic square.
```

Please make sure you include the appropriate program header information at the top of the first page of your program (see the department guidelines). When you are finished, compile, and then run the program. If it does not compile, fix any errors and try again. When your program is working, submit your **magic_square.cpp** file along with your output file, **a1.txt** by midnight on **WEDNESDAY, SEP. 6TH.**