

## Programming Assignment

Due Date : Wednesday February 4<sup>th</sup> - 2016

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### Note about This Assignment

This assignment lets you get familiar with C++.

**It is important that you follow the instructions. Do not try to improve on the design described here. Read the entire assignment before you start working on it.**

This is intended to be a warmup assignment. It does not reflect the kinds of things that we will be doing. Expect later assignments to be larger, and to involve principles of data structures.

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### Background

In [recreational mathematics](#), a **magic square** is an arrangement of distinct numbers (i.e. each number is used once), usually [integers](#), in a [square](#) grid, where the numbers in each row, and in each column, and the numbers in the [main and secondary diagonals](#), all add up to the same number. A magic square has the same number of rows as it has columns, and in conventional math notation, " $n$ " stands for the number of rows (and columns) it has. Thus, a magic square always contains  $n^2$  numbers, and its size (the number of rows [and columns] it has) is described as being "of order  $n$ ".<sup>[1]</sup> A magic square that contains the integers from 1 to  $n^2$  is called a *normal* magic square. (The term "magic square" is also sometimes used to refer to any of various types of [word squares](#).)

### For Example

2	7	6	→15
9	5	1	→15
4	3	8	→15
15	↓15	↓15	↓15

## Requirements

The requirements tell what the program is supposed to do.

Write a C++ program that :

1. Allow the user to enter the size of the square such as N. N must be greater than or equal to 2.
2. Create an array of size N x N.
3. Use function to Populate the array with distinct random numbers.
4. Use a function to determine whether the numbers in n x n array are magic square numbers.
5. Repeat steps 1 – 4 until the user terminates the program.

**Note : use the following formula in order to find the magic number**

$$magicNumber = \frac{n(n^2 + 1)}{2}$$

**Note : How would you modify the program so that given the size of the array , it generates a magic square .**

## **Style Guidelines :**

At the beginning of your program ( and **before** the #include statement ), include the following :

**Header comments** (file documentation block) should be at the top of each file and should contain: Author / s, Due Date, Assignment Number, Course number and section, Instructor, and a brief description of the purpose of the code in the file. For example :

```
//      Author / s : (Your names here!!)
//      Due Date :
//      Programming Assignment Number 1
//      Spring 2016 - CS 3358 - Section Number
//
//      Instructor: Husain Gholoom.
//
//      <Brief description of the purpose of the program>
```

### **Variable names :**

- Must be meaningful.
- The initial letter should be lowercase, following words should be capitalized, no other caps or punctuation ( i.e. `weightInPounds` ).
- Each variable must be declared on a separate line with a descriptive comment.

### **Named constants :**

- Use for most numeric literals.
- All capitals with underscores ( i.e. `TX_STATE_SALES_TAX` )
- Should occur at top of function, or global (only if necessary)

**Line length** of source code should be no longer than 80 characters (no wrapping of lines).

### **Indentation :**

- Use 2-4 spaces (but be consistent throughout your program).
- Indent blocks, within blocks, etc.
- Use blank lines to separate sections.

## Comments for variables :

All variable definitions should be commented as follows:

```
int  gender;    // integer value for the gender,
                // 1 = Male , 2 = Female ,
```

## Rules :

1. The program is due at **starting** time of the class.
2. Your program **must compile** and run.
3. Your program must be **documented according the style above . See the website for the sample programming style program.**
4. Must **use functions , repetitions , and control structures**
5. You must use the appropriate libraries in writing this program.
6. Must properly format the output as it is shown on the sample run below. Replace my name with your name
7. You must name your program as :

○ LastName\_FirstName\_PG1.cpp

Where LastName is your Last Name and FirstName is your First Name. For example , the file name should look something like : Gholoom\_Husain\_PG1.cpp ( **not .cbp** )

8. You must upload your programs no later than the starting of class time on the due date. **No late assignments will be accepted.**

**To upload your program** , go to the CS department's website, click on resources , then select homework upload.

9. You must **also** turn in hard copy of your source code no later than the starting of class time on the due date . should the hard copy consist of more than one page , then , the hard copy must be **stapled**. if you are unable to turn in a printout during class, you can take the program to the computer science department and hand it to the front desk personal (Comal 211 ) before the deadline. Make sure that the front office stamps the program. Make sure that include the date and time. Finally ,make sure that they place the program in my mailbox.

**DO NOT** slide your program under my office door – It will **NOT** be accepted

10. Violating any item from the above rules will result in Grade **ZERO** for the entire assignment. **NO EXCEPTIONS.**

## Sample Run

Welcome to my magic sequence program . The function of the program is to

1. Allow the user to enter the size of the magic square such as  $N$  .  $N \geq 2$ .
2. Create an array of size  $N \times N$ .
3. Populate the array with distinct random numbers.
4. Display the sum for each row , column , and diagonals then determine whether the numbers in  $N \times N$  array are magic square numbers.

Enter the size of the magic square : 3

The magic sequence that is created for the size 3 :

8	1	6
3	5	7
4	9	2

The magic number is 15

Sum of numbers in Row	# 1	=	15
Sum of numbers in Row	# 2	=	15
Sum of numbers in Row	# 3	=	15
Sum of numbers in Column	# 1	=	15
Sum of numbers in Column	# 2	=	15
Sum of numbers in Column	# 3	=	15
Sum of numbers in first diagonal		=	15
Sum of numbers in second diagonal		=	15

The above is magic square

Would like to find another magic square - Enter y or Y for yes  
or n | N for no y

Enter the size of the magic square : 2

The magic sequence that is created for the size 2 :

1 3

2 4

The magic number is 5

Sum of numbers in Row # 1 = 4

Sum of numbers in Row # 2 = 6

Sum of numbers in Column # 1 = 3

Sum of numbers in Column # 2 = 7

Sum of numbers in first diagonal = 5

Sum of numbers in second diagonal = 5

The above is not a magic square

Would like to find another magic square - Enter y or Y for yes  
or n | N for no y

Enter the size of the magic square : -5  
Error \*\*\* magic square size Must be >= 2

Would like to find another magic square - Enter y or Y for yes  
or n | N for no h  
Error \*\*\* Invalid choice - Must enter y | Y | n | N

Would like to find another magic square - Enter y or Y for yes  
or n | N for no n

This magic square algorithm is implemented By [Husain Gholoom](#)