

# Lab 5

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<b>Due</b>	Sunday by 11:59pm	<b>Points</b>	100	<b>Submitting</b>	a file upload	<b>File Types</b>	zip
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## Recursive Functions

### Goals

- Create and use recursive functions

In this lab, we will write a program that uses three recursive functions.

### Requirements:

**Important:** You must use the array for this lab, no vectors allowed.

#### 1. First Recursive Function

Write a function that recursively **prints a string in reverse**. The function has **ONLY** one parameter of type string. It **prints** the reversed character to the screen followed by a newline character.

**Example:** Input of “Hello, world” should output “dlrow ,olleH(newline)”.

**Note:** Your recursive function just needs to **print** the reverse of the string rather than actually reversing the string itself.

#### 2. Second Recursive Function

Write a function that recursively **calculates the sum of an array of integers**. The function has 2 parameters:

- A pointer to the integer array
- An integer for the number of elements in the array.

The function must use a recursive call to sum the value of all integers.

#### 3. Third Recursive Function

Write a function that recursively **calculates the triangular number** of an **integer N**. You can set an up-limit for N. You don't need to handle extra large integers.

The function has one parameter that take in integer N.

**Example:** If the integer N is 3, the function should output the triangular number 6, since  $1 + 2 + 3 = 6$ .

For more information on triangular number: [https://en.wikipedia.org/wiki/Triangular\\_number](https://en.wikipedia.org/wiki/Triangular_number)  
([https://en.wikipedia.org/wiki/Triangular\\_number](https://en.wikipedia.org/wiki/Triangular_number))

## Menu

Your program needs to demonstrate all three functions by providing a menu.

The menu should provide user choices to **select one of the three functions to call**, after prompting user input for function call and the function outputs results, the menu should **go back to the first menu** to let the user continue choosing functions to call.

If user choose **function #1**, the menu should prompt the user to enter a **string** and your program reversely prints the string

**Note:** Use getline() in standard library so the input takes space characters.

If user chooses **function #2**, the menu should first prompt the user an **integer input for the number of integers** in the array, then **a series of integers to fill the array**. Afterwards, the program prints sum of the array of integers.

If the user chooses **function #3**, the menu should prompt the user **an integer**, then the program prints the triangular number of that number.

In addition to the 3 function options inside the first menu, the menu must also provide the **option to quit the program**. You can add input validation functions into these the menu to make it robust.

## File organization

You can put all your recursive functions in a single .cpp file or separate them into different .cpp files.

However, you must separate the implementation and declaration in .cpp and .hpp files. **Note:** You do not need to make a class for this lab.

## What you need to submit

- All the program files including header and source files (.cpp/.hpp)
- Makefile

**Important:** Put all the files in a single .zip file and submit it on Canvas.

## Grading

- Programming style – 10%
- Implement the function to reversely print string – 20%

- Implement the function to calculate the sum of the array – 25%
- Implement the function to calculate the triangular number – 25%
- Implement a program with a menu to call each function or to exit – 20%

<b>Lab 5</b>		
<b>Criteria</b>	<b>Ratings</b>	<b>Pts</b>
Programming Style Code organization, commenting, meaningful variable and function names, no memory leaks or seg faults.		10.0 pts
Implement Function to Recursively Print String		20.0 pts
Implement Recursive Sum Array Function		25.0 pts
Implement Recursive Triangular Number Function		25.0 pts
Implement Menu		20.0 pts
		Total Points: 100.0