**Programming Fundamentals**

**Lab Manual**

**Week 05 – Lab 01**

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**Function Basics**

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# Objectives

* Basic Introduction to Function.
* The structure of a program based on function.
* Function header and Function body
* Function Declaration and Function Prototype

# Introduction

After completing this lab, the students should be able to

* Explain the concepts of functions.
* Explain what a function prototype is and how that is different from the function definition.
* Convert the code processing in the main function to a function called from the main function.

**Background**

The function is a good mechanism to encapsulate code used repeatedly in a program so that it can be called from other parts of the code. A function does not use a keyword called ***function*** but instead the programmer has to define function prototype before the ***main*** function and then define the function again later.

A function has the following format

***type function\_name (optional parameter list)***

***{***

***function code;***

***return value;***

***}***

Here types are in general the types of C variable types including int, double, char etc. The function does some processing and the calculated value is returned using the return value; instruction in the function. In the main function or the other functions calling this function\_name, the value returned is used like the instruction:

***calling\_value = function\_name (parameters);***

A function does not need to always return a value. A function not returning a value can omit the return statement and the function type is void in this case.

Function prototype has the following format:

**type function\_name (list of variable types);**

Function protoype examples are:

Example 1. int compute (int);

Example 2. void tryout ();

Function prototypes differ from the function definitions in two places:

there is no code (no {} with code in between) and the variable names do not follow the types.

A function prototype can return nothing, in which case void is the type returned; also it may have no parameters at all like example 2 above. The function prototype is declared before the main function with the function calls inside the main function or the other functions calling this function. The function definitions are put after the main function.

# Lab Task 1

Make a program to calculate following expression. Use predefined functions of math library in c++.

| b2 – 4ac |

- b +

2a

where a, b and c are input variables.

**Note**: Include math.h from C++ Standard Libraries.

# Lab Task 2

A) Write a function to print out f(x) = ax2 + bx + c for a = 1.0, b = 2.0, and c = 1.0 for x = 3.0, and 4.0 respectively.

B) Write a function that computes function the following expression with x as the only input parameter and returns the result.

f(x) = ax2 + bx + c

Note: Values of a,b and c should be input by the user.

# Lab Task 3

Write a Program that will have functions of

1. Addition
2. Subtraction
3. Division
4. Multiplication
5. Power function
6. Square function
7. Square root function
8. Factorial function
9. nPr
10. nCr

**Power function:** **Base** and **Power** shall be provided by user and function shall calculate the power and give the result by returning the value to function.

Example: User Inputs 23 = 8 (Result)

**Square function:** User will provide the **base** and function will calculate the square of the value provided and give the result by returning the value to function.

Example: User Input 52 = 25(Result), 32 = 9

**Square Root function:** User will provide the value and function will calculate the square root of the value provided and give the result by returning the value to function.

Example: User Input √25 =5(Result), √9 = 3

**Factorial function:** User will provide the value and function will calculate the factorial of the value provided and give the result by returning the value to function.

Example: User Input 5! = 120 (Result)

**nPr and nCr function:** User will provide the value (n,r) and function will calculate the nPr and nCr of the values provided and give the result by returning the value to function.

**Note:** Make two separate functions for nPr and nCr.

**Formula for nPr**

n=10, r=3

***nPr = n!/(n-r)!  
  
10P3 = 10!/(10-3)!***

**Formula for nCr**

n=10, r=3

***nCr= n!/r!(n-r)!  
  
10C3 = 10!/3!(10-3)!***

# Lab Task 4

Create user defined header file and name your file “myMath.h” and move all above functions in myMath.h

Include myMath.h in your .cpp file.