

CL-118
Programming
Fundamentals

LAB - 08
Functions and Strings

NATIONAL UNIVERSITY OF COMPUTER AND EMERGING SCIENCES
Fall 2023

LAB 08

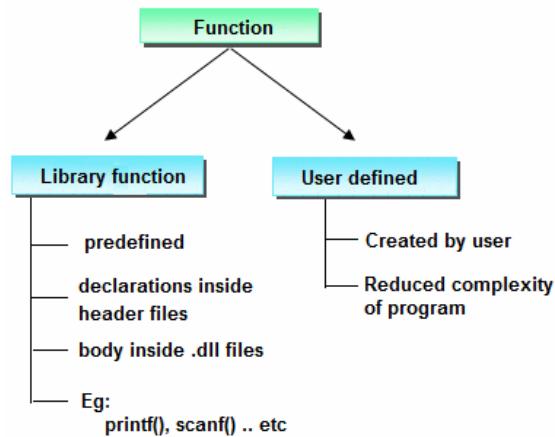
In C, we can divide a large program into the basic building blocks known as function. The function contains the set of programming statements enclosed by {}. In other words, we can say that the collection of functions creates a program. The function is also known as procedure or subroutine in other programming languages.

TYPES OF FUNCTIONS IN C PROGRAMMING

Depending on whether a function is defined by the user or already included in C compilers, there are two types of functions in C programming

1. Standard library functions
2. User defined functions

Functions Name	Description
Printf()	Print data
Scanf()	Read data
Getchar()	Read a single character
Sqrt()	Calculate the square
Pow()	Calculate the power
Fopen()	Open the specified file



BENEFITS OF USING FUNCTIONS

1. It provides modularity to your program's structure.
2. It makes your code reusable. You just have to call the function by its name to use it, wherever required.
3. In case of large programs with thousands of code lines, debugging and editing becomes easier if you use functions.
4. It makes the program more readable and easy to understand.

HOW USER-DEFINED FUNCTION WORKS?

```
#include <stdio.h>

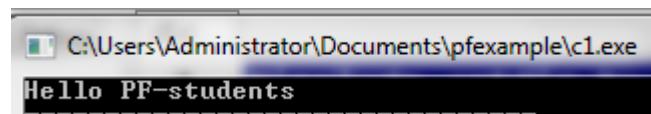
int addNumbers(int a, int b);

int main()
{
    ...
    sum = addNumbers(n1, n2);
    ...
}

int addNumbers(int a, int b)
{
    ...
    return result;
}
```

Example: User-

Here is an example one to print "Hello pf-students". To perform this task, a user-defined function printName () is defined.



Here is an example two to add two integer numbers. To perform this task, a user-defined function sum () is defined.

```
#include <stdio.h>
void printName ();
void main ()
{
    printf("Hello ");
    printName();
}
void printName()
{
    printf("PF-students");
}
```

```
#incl Going to calculate the sum of two numbers:
int su 3
void main()
{
    int result;
    printf("\n Calculate the sum of two numbers:");
    result = sum();
    printf("%d",result);
}
int sum()
{
    int a,b;
    printf("\nEnter two numbers: ");
    scanf("%d %d",&a,&b);
    return a+b;
}
```

FUNCTION PROTOTYPE

A function prototype is simply the declaration of a function that specifies function's name, Parameters and return type. It doesn't contain function body.

A function prototype gives information to the compiler that the function may later be used in the program.

SYNTAX OF FUNCTION PROTOTYPE

returnType functionName (type1 argument1, type2 argument2,...);

In the above example, int sum(int a, int b); is the function prototype which provides following information to the compiler:

1. name of the function is addNumbers()
2. return type of the function is int
3. two arguments of type int are passed to the function

The function prototype is not needed if the user-defined function is defined before the main() function.

CALLING A FUNCTION

Control of the program is transferred to the user-defined function by calling it.

SYNTAX OF FUNCTION CALL

functionName (argument1, argument2, ...);

In the above example, function call is made using `sum(n1,n2);` statement inside the main().

FUNCTION DEFINITION

Function definition contains the block of code to perform a specific task i.e. in this case, adding two numbers and returning it.

SYNTAX OF FUNCTION DEFINITION

```
returnType functionName(type1 argument1,  
type2 argument2)
```

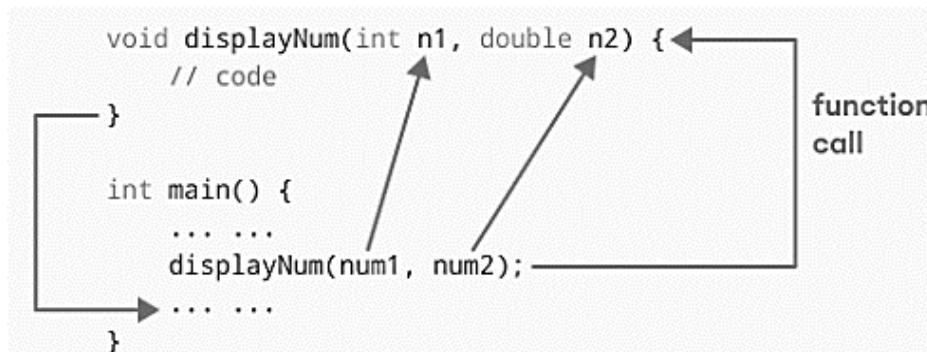
```
{  
    //body of the function
```

```
}
```

When a function is called, the control of the program is transferred to the function definition. And, the compiler starts executing the codes inside the body of a function.

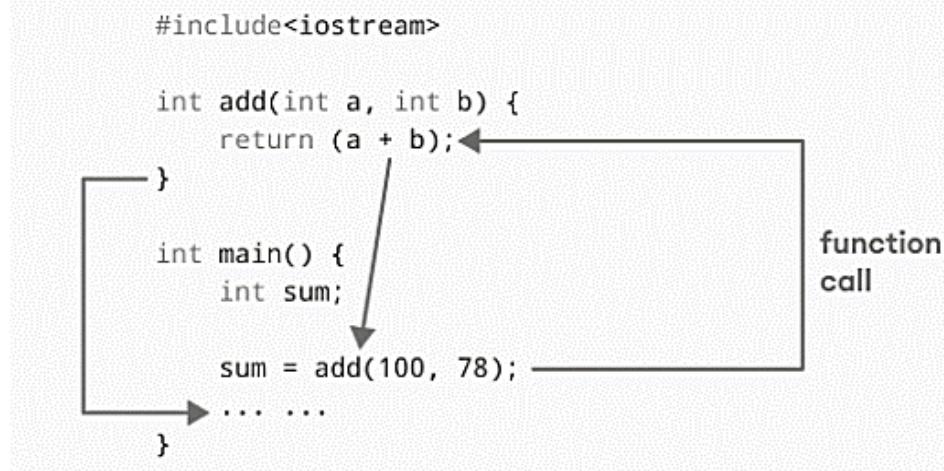
PASSING ARGUMENTS TO A FUNCTION

In programming, argument refers to the variable passed to the function. The parameters a and b accepts the passed arguments in the function definition. These arguments are called formal parameters of the function.



RETURN STATEMENT

The return statement terminates the execution of a function and returns a value to the calling function. The program control is transferred to the calling function after return statement. we have the data type int instead of void. This means that the function returns an int value.



SYNTAX OF RETURN STATEMENT

return (expression);

INTRODUCTION TO STRINGS

- String is a series of characters treated as a single unit.
- A string may include letters, digits and various special characters such as +, -, *, / and \$.
- String literals, or string constants in C are written in double quotation marks.

STRING DECLARATION AND INITIALIZATION

A string in C is implemented as an array, so declaring a string variable is the same as declaring an array of type char.

EXAMPLE:

```
char var[9] = {'F','A','S','T',' ','U','N','I'};
```

OR

```
char string_var[9] = "FAST UNI";
```

The variable string_var will hold strings from 0 to 8 characters long.

NULL CHARACTER ('\0')

- Null character marks the end of a string.
- All of C's string handling functions simply ignore whatever is stored in the cells following the null character.
- When defining a character array to contain a string, the array must be large enough to store the string and its terminating null character.

MEMORY REPRESENTATION

F	A	S	T		U	N	I	\0
0	1	2	3	4	5	6	7	8

STRING INPUT/OUTPUT LIBRARY

INPUT/OUTPUT WITH PRINTF AND SCANF

- A string can be read using the %s placeholder in the scanf function. However, it has a limitation that the strings entered cannot contain spaces and tabs.

```
Enter Sentence:
Fast University

You entered:
Fast
```

In the above code if multiple words (separated by space) are entered, only the first word as shown in the output attached.

INPUT/OUTPUT WITH GETS AND PUTS

To overcome the problem with scanf, C provides another function named gets which reads characters (including spaces and tabs) until the user presses the Enter key. A call to this function takes the following form:

```
#include<stdio.h>
int main()
{
    char sentence[80];
    printf("Enter Sentence:\n");
    gets(sentence);
    printf("\n\nYou entered:\n");
    printf("%s", sentence);
    return 0;
}
```

where, sentence is an array of char, i.e., a character string. This function reads characters from the keyboard until newline is entered and then stores the character in the array. The last character is read and converted to a null character '\0'.

C provides another function named puts to print a string on the display. A typical call to this function takes the following form:

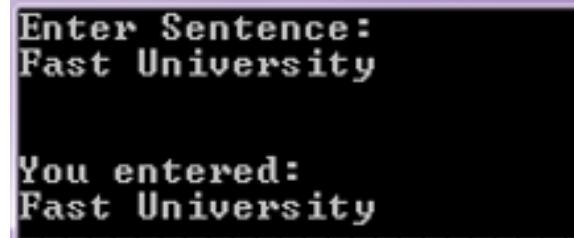
```
puts(sentence);
```

where, sentence is an array of characters, i.e., a character string. This string is printed on the display followed by a newline character.

STRINGS-FUNCTIONS

EXAMPLES

[strlen function:](#)



strlen vs sizeof

strlen returns you the length of the string stored in an array, however **sizeof** returns the total allocated size assigned to the array. So if I consider the above example again, then the following statements would return the below values.

strlen(str1) returned value 23.

sizeof(str1) would return value 30 as the array size is 30

strcmp function:

It compares the two strings and returns an int

- if Return value < 0 then it indicate
- if Return value > 0 then it indicate
- if Return value = 0 then it indicate

```
#include<stdio.h>
#include<string.h>
int main()
{
char str1[30] = "Programming Fundamentals";
printf("Length of string str1: %d", strlen(str1));
return 0;
}
```

SIGNIFICANCE

strcmp function:

It compares both the string till n characters or in other words it compares first n characters of both the strings.

```
#include <stdio.h>
#include <string.h>

int main () {
    char str1[15];
    char str2[15];
    int ret;

    strcpy(str1, "abcdef");
    strcpy(str2, "ABCDEF");
    ret = strncmp(str1, str2, 4);
    if(ret < 0) {
        printf("str1 is less than str2");
    } else if(ret > 0) {
        printf("str2 is less than str1");
    } else {
        printf("str1 is equal to str2");
    }
    return(0);
}
```

strcat function:

It concatenates two strings and returns th

strncat function:

It concatenates n characters of str2 to string str1.

TYPICAL C PROGRAM DEVELOPMENT ENVIRONMENT

COMPILER VS IDE

IDE - Integrated Development Environment

IDE is the software that helps to write code, provides code completion, code suggestions and other neat stuff. Therefore, Dev-C++ is an IDE and not Compiler but it lets us compile code too by using

strcpy function:

It copies the string str2 into string str1, including the end character (terminator char '\0').

C - DATATYPES:

Variables are classified according to their

```
#include <stdio.h>
#include <string.h>
int main()
{
    char s1[10] = "Hello";
    char s2[10] = "World";
    strncat(s1,s2, 3);
    printf("Concatenation using strncat: %s", s1);
    return 0; }
```

strchr function:

It searches string str for character ch

```
#include <stdio.h>
#include <string.h>
int main()
{
    char s1[20] = "string 1";
    char s2[50] = "string 2 : I will be copied into s1";
    /* this function has copied s2 into s1*/
    strcpy(s1,s2);
    printf("String s1 is: %s", s1);
```

strstr function:

It is similar to strchr, except that it searches for string srch_term instead of a single char.

Introduction to Filing

```
#include <stdio.h>
#include <string.h>
int main()
{ char inputstr[70] = "String Function in C at BeginnersBook.COM";
  printf ("Output string is: %s", strstr(inputstr, "Begin"));
  return 0; }
```

LAB#08 EXERCISES

QUESTION # 1

Create a C program that swaps the values of two integers using a user-defined function, swapIntegers. The user inputs two integer values, and the program uses the function to swap them. It should perform the swap, and display the updated values.

QUESTION # 2

Write a C program with a user-defined function calculate to perform basic arithmetic operations such as addition, subtraction, multiplication, and division. The program should take two numbers and an operation choice as input, and then use the function to perform the operation.

QUESTION # 3

You are working on a text processing program. Create a C program that reads a text input from the user and searches for a specific character (e.g., 'a') within the text using the strchr function. Display the total count of occurrences of the character in the input text.

QUESTION # 4

Your task is to create a C program that performs password length validation and user authentication based on the given requirements below:

- a) Prompts the user to enter a password.
- b) Validates the entered password by checking if it is at least 8 characters long.
- c) If the password meets the length requirement, the program should compare it to a stored password "Secure123."
- d) If the entered password matches the stored password, display "Login successful. Welcome!" Otherwise, display "Login failed. Incorrect password."

QUESTION # 5

In this C program, you are tasked with creating a function called decideCarUsage that helps users decide whether they should use their car on a particular day of the week. Users provide the numeric part of their car's number and the day of the week (1 to 7). The program applies a simple rule: even-numbered cars should be used on even days, and odd-numbered cars on odd days. The function returns 1 if the car should be used and 0 if it should not.

QUESTION # 6

You are given an array of integers. Write a C program that defines a user-defined function processArray to calculate the sum, maximum, and minimum values in the array. The program should take the array and its size as parameters and use the function to compute these values.

Input: Array is [4, 8, 1, 15, 6]

Output:

Array Sum: 34

Maximum Value: 15

Minimum Value: 1

QUESTION # 7

You are developing a C program for a coffee shop that offers discounts based on customer loyalty and purchase history. The program should work as follows:

The program should have a user-defined function named calculateDiscount that takes two parameters: the customer's total purchase amount and the number of times they have visited the shop in the past month. determine the discount based on the following criteria:

1. If the customer has visited the shop more than 10 times in the past month and their total purchase amount is \$50 or more, they get a 15% discount.
2. If the customer has visited the shop more than 5 times in the past month and their total purchase amount is \$30 or more, they get a 10% discount.
3. For all other customers, no discount is applied.

The function should return the calculated discount amount.

In the main part of the program, prompt the user to input their total purchase amount and the number of times they have visited the shop. Call the calculateDiscount function to calculate the discount, and display the discount amount to the user.