"Heaven's Light is Our Guide"

Department of Computer Science & Engineering

RAJSHAHI UNIVERSITY OF ENGINEERING & TECHNOLOGY

Programming in C

Lab Manual : 1

Fundamentals of C Programming

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Lab Objectives:

- Explain the basic components of a C Program
- To study about data type, identifiers and operators
- To explain the operation of arithmetic operators, relational operators, increment & decrement operators
- To acquire knowledge for the evaluation of different types of expressions

Background:

Some basic header files used in C**:**

Header File	**Explanation**
<stdio.h>	Contains function prototypes for the standard input output library function and the information to use them
<stdlib.h>	Contains function prototypes for the conversion of number to text and text to number, memory allocation, random number, and other utility functions
<math.h>	Contains function prototypes for math library functions (such as: abs(), sqrt(), pow()…)
<string.h>	Contains function prototypes for string processing functions (such as: strlen(), strrev()…)

Some basic Data types used in C:

Name	Description	Size*	Range*
char	Character	1 byte	signed: -128 to 127 unsigned: 0 to 255
short int (short)	Short integer	2 bytes	signed: -32768 to 32767 unsigned: 0 to 65535
int	Integer	4 bytes	signed: -2147483648 to 2147483647 unsigned: 0 to 4294967295
long int (long)	Long integer	4 bytes	signed: -2147483648 to 2147483647 unsigned: 0 to 4294967295
float	Floating point number	4 bytes	3.4e +/- 38 (~7 digits)
double	Double precision floating point number	8 bytes	1.7e +/- 308 (~15 digits)

There are two types of arithmetic operators in C**:**

- **Unary arithmetic operators (++ , − −)**
- **Binary arithmetic operators (+ , − , * , / , %)**

➔ Increment & Decrement Operators**:** C has two special operators for incrementing or decrementing a variable by 1:

- ++ **(increment)**
- **--** **(decrement)**

➔ Compound assignment operators**:**

Operator	Example	Longer Expression	Description
+=	a += b	a = a + b	Add, then assign
-=	a -= b	a = a - b	Subtract, then assign
*=	a *= b	a = a * b	Multiply, then assign
/=	a /= b	a = a / b	Divide, then assign
%=	a %= b	a = a % b	Compute remainder, then assign

➔ **The ‘ sizeof ’ operator:**

It is a unary operator which is used to find the size of data type, constant, arrays, structure etc.

Some Examples:

1. **Write a program that displays “Why so serious ??? ...”.**

   Program code:

```
#include<stdio.h>
int main(){
printf("Why so serious ??? ... ");
return 0;
}
```

2. **Write a program that read an integer, a floating point number, a long integer, a character and displays all of them.**

Program code:

```
#include<stdio.h>
int main(){
int integerNumber;
float floatNumber;
long longInteger;
char character;
//        For Integer Number
printf("\nEnter an integer: ");
scanf("%d",&integerNumber);
//        For Floating Point
printf("\nEnter a floating point number: ");
scanf("%f",&floatNumber);
//        For Long Integer
printf("\nEnter a long number: ");
scanf("%ld",&longInteger);
//        For Character
printf("\nEnter a character: ");
scanf(" %c",&character);
//        Display All:
printf("\n your integer is %d ", integerNumber);
printf("\n your floating point number is %f ", floatNumber);
printf("\n your long number is %ld ", longInteger);
printf("\n your character is %c ", character);
return 0;
}
```

3. **Write a program that reads two integers and displays their sum, difference (i.e., Number1 – Number2) & product.**

Program Code:

```
#include<stdio.h>
int main(){
int a,b;
printf("Enter first integer:");
scanf("%d",&a);
printf("\nEnter second integer:");
scanf("%d",&b);
printf("\nSum is %d",a+b);              // for summation
printf("\nDifference is %d",a-b);       // for subtraction
printf("\nProduct is %d",a*b);           // for multiplication
return 0;         }
```

4. **Write a program that reads two integers and compares them by using different Relational Operators (< , > , <= , >= , == , !=).**

Program code:

```
#include<stdio.h>
int main(){
   int number1, number2;
   printf("Enter 1st Integer(x): ");
   scanf("%d",&number1);
   printf("Enter 2nd Integer(y): ");
   scanf("%d",&number2);

   printf("\nFor '<' Operator:\n");
   printf("\t x < y : %d\n",number1<number2);
   printf("\t y < x : %d\n",number2<number1);
   printf("\nFor '>' Operator:\n");
   printf("\t x > y : %d\n",number1>number2);
   printf("\t y > x : %d\n",number2>number1);
   printf("\nFor '<=' Operator:\n");
   printf("\t x <= y : %d\n",number1<=number2);
   printf("\t y <= x : %d\n",number2<=number1);
   printf("\nFor '>=' Operator:\n");
   printf("\t x >= y : %d\n",number1>=number2);
   printf("\t y >= x : %d\n",number2>=number1);
   printf("\nFor '==' Operator:\n");
   printf("\t x == y : %d\n",number1==number2);
   printf("\t y == x : %d\n",number2==number1);
   printf("\nFor '!=' Operator:\n");
   printf("\t x != y : %d\n",number1!=number2);
   printf("\t y != x : %d\n",number2!=number1);
   return 0;
}
```

5. **Write a program that reads the radius of a circle and display its area.**

Program code:

```
#include<stdio.h>
#define PI 3.1416        // Constant (PI) Definition
int main(){
   float radius, area;
   printf("Enter the Radius of the Circle: ");
   scanf("%f",&radius);
   area = PI * radius * radius;
   printf("\n The Area of the Circle = %.3f\n", area);
   return 0;       }
```

6. **Write a program that displays the size of constant and different types of variables.**

Program code:

```
#include <stdio.h>
#define PI 3.1416
int main(){
   int a;          float b;          double c;        char d;
   printf("Size of Constant PI=%d bytes\n",sizeof(PI));
   printf("Size of int=%d bytes\n",sizeof(a));
   printf("Size of float=%d bytes\n",sizeof(b));
   printf("Size of double=%d bytes\n",sizeof(c));
   printf("Size of char=%d byte\n",sizeof(d));
   return 0;
}
```

Exercise:

1. **Write a program that displays your name, roll no. & department (each information in a new line).**

   Sample Output:
   NAME**:** James Bond
   Roll no.**:** 643007
   Department**:** Crime & Investigation

2. **Write a program that generates the following output:**
   (N.B.: No need to use any loop**)**

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

3. **Write a program that converts dollar into taka.**
4. **Write a program that converts a given number of days into months and days.**
   [Assume, 1 month = 30 days]
5. **Write a program that reads the base & the height of a triangle and displays its area.**
6. **Write a program that reads temperature in Celsius and displays in Fahrenheit.**
   The equation to convert temperature is-
   C / 5 = (F-32) / 9
   Here, C is temperature in Celsius and F is temperature in Fahrenheit**.**
7. **Write a program that accepts two different values in variable a & b and interchanges their values.**