LAB MANUAL

FOR

PROGRAMMING IN C

First Semester

Bachelor in Computer Engineering

Prepared by

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National Academy of Science and Technology (NAST)

Uttar Behadi-04, Dhangadhi

INSTRUCTIONS TO STUDENTS FOR PREPARING PROGRAMMING IN C LAB REPORT

This Lab Manual is prepared to help the students with their practical understanding and development of programming skills, and may be used as a base reference during the lab/practical classes.

Students have to submit Lab Exercise report of previous lab into corresponding next lab, and can be collected back after the instructor/course coordinator after it has been checked and signed. At the end of the semester, students should compile all the Lab Exercise reports into a single report and submit during the end semester sessional examination.

"Sample of Lab report" is shown for LAB Sheet #1 in this manual. For the rest of the labs, the reporting style as provided is to be followed. The lab report to be submitted during the end semester Sessional Examination should include at least the following topics: -

1. Top Cover page (to be used while compiling all the Lab Exercise reports into a single report)
2. Index (to be used while compiling all the Lab Exercise reports into single report)
3. Cover page (to be attached with every Lab Exercise)
4. Title of the program
5. Algorithm (Optional)
6. Flowchart (Optional)
7. Coding
8. Output (compilation, debugging & testing)

For additional lab exercises given in each module, students only need to write coding and output in the report. Also, students have to show coding and output to the instructor or course coordinator in the lab.

Note: The lab exercises may not be completed in a single specific lab. Students are encouraged to complete the programming questions given in the exercise prior to come to the lab hour and do the lab for the given programs.

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Pokhara University

National Academy of Science and Technology

(NAST)

PROGRAMMING IN C LAB REPORT

Submitted By:

Name: _____

Roll No. _____

Submitted To:

Department of Computer Engineering

Submission Date Signature

National Academy of Science and Technology (NAST)

Uttar Behadi-04, Dhangadhi

List of Lab Exercise

S.N.	Lab Exercise	Sheet	Remarks
1.	Syntax and Structure of C	Lab Sheet #1	
2.	Data types, Operators and Expression	Lab Sheet #2	
3.	Formatted and Unformatted I/O	Lab Sheet #3	
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9.	Pointer	Lab Sheet #9	
10.	Structure and Union	Lab Sheet #10	
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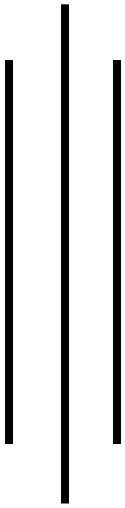
Programming in C

Lab Report



1st Semester, BE Computer

LAB Sheet #1

Submitted By

Name:

Roll No:

Submitted To

Instructor/Lecturer Name

Signature:

Submission Date

……

National Academy of Science and Technology (NAST)

Uttar Behadi-04, Dhangadhi

Lab Exercise 1

Syntax and Structure of C

Objective:

- To be familiar with syntax and structure of C- programming.
- To learn problem solving techniques using C

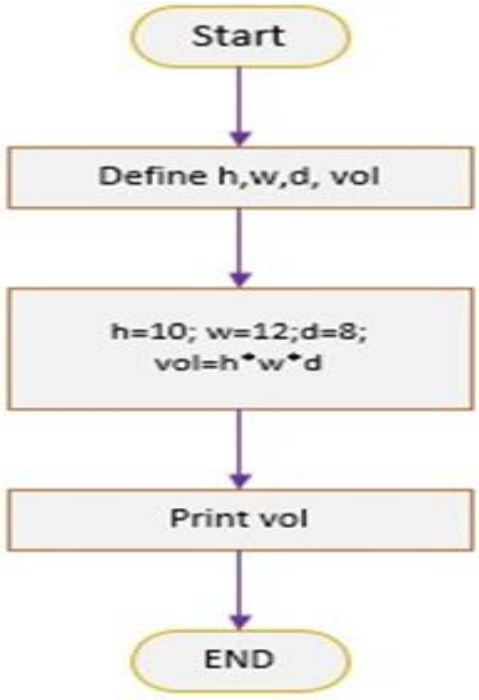
Title:

- Write a Program to calculate and display the volume of a CUBE having its height (h=10cm), width (w=12cm) and depth (8cm).

Algorithm:

1. Start
2. Define variables: h(int), w(int), d(int), vol(int)
3. Assign value to variables: h = 10, w=12, d=8
4. Calculate the volume as: vol = h*w*d
5. Display the volume (vol)
6. Stop

Flowchart:



Code: *(Use comments wherever applicable)*

```
//Following code is written and compiled in GCC

#include<stdio.h> void
main()
{
//start the program
int h,w,d,vol;     //variables declaration
h=10;w=12;d=8;     //assign value to variables
vol=h*w*d;         //calculation using mathematical formula
printf("The Volume of the cube is: %d",vol); //display the
volume
 getch();
//end the main program
}
```

Output:

The Volume of the cube is: 960

Lab exercises (please code yourself and show the output to instructor):

1. Write a program to display “hello world” in C.
2. Write a program to add two numbers (5&7) and display its sum.
3. Write a program to multiply two numbers (10&8) and display its product.
4. Write a program to calculate area of a circle having its radius (r=5).
5. Write a program to calculate simple interest for a given P=4000, T=2, R=5.5. (I = P*T*R/100

Lab Exercise 2

Data types, Operators and Expression

Objective:

- To be familiar with different data types, Operators and Expressions in C.

Title:

- Write a program to take input of name, rollno and marks obtained by a student in 4 subjects of 100 marks each and display the name, rollno with percentage score secured.

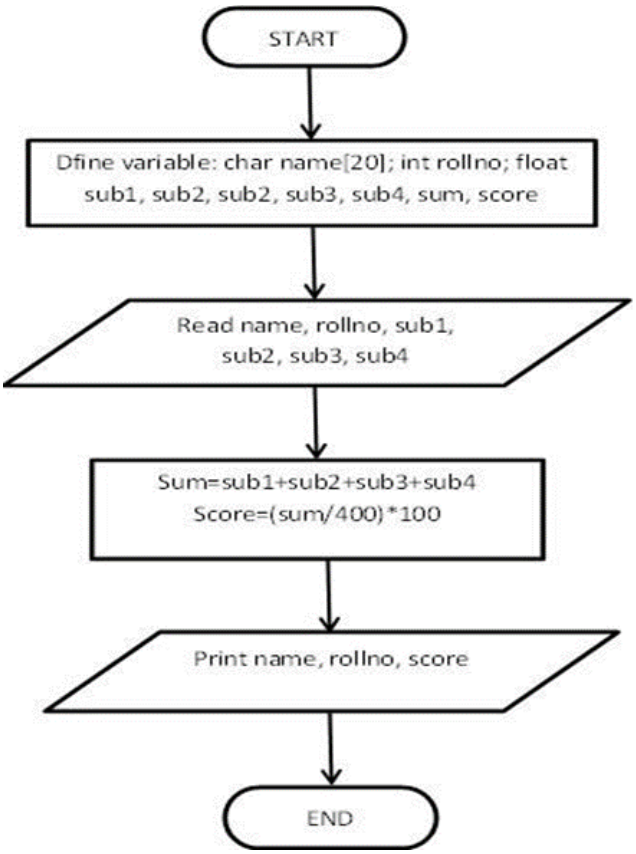
Algorithm:

1. Start
2. Define variables: name, rollno, sub1, sub2, sub3, sub4, sum, score
3. Take input from keyboard for all the input variables
4. Calculate the sum of marks of 4 subjects and also calculate the percentage score as:

   sum = sub1 + sub2 + sub3 + sub4;

   score = (sum/400) * 100
5. Display the name, roll number and percentage score.
6. Stop

Flowchart:



Code:

```
        //Following code is written and compiled in Code Blocks
#include<stdio.h>
#include<conio.h>
void main()
{
   char name[20];
   int rollno;
   float sub1, sub2, sub3, sub4, sum, score;
   printf("Enter name of student: ");
   scanf("%s",&name);
   printf ("\n Enter Roll Number: ");
```

```
    scanf("%d", &rollno);
    printf ("\n Enter Marks in 4 Subjects:\n");
    scanf("%f%f%f%f", &sub1, &sub2, &sub3, &sub4); sum=sub1+sub2+sub3+sub4;
    score = (sum/400)*100;
    printf("\n Name of student: %s", name);
    printf("\n Roll Number: %d", rollno);
    printf ("\nPercentage score secured: %2.2f%c", score, '%');
    getch();
}
```

Output:

```
Enter name of student: Hari Sharma
Enter Roll Number: 10
Enter Marks in 4 Subjects:
5
5
5
5
Name of student: Hari Sharma
Roll Number: 10
Percentage score secured: 5.00%
```

Lab exercises (please code yourself and show the output to instructor):

1. Write a program to declare two integer and one float variables then initialize them to 10, 15, and 12.6. Also print the variable values in the screen.
2. Write a C program to prompt the user to input 3 integer values and print these values in forward and reversed order.
3. Write a program to calculate simple and compound interest.
4. Write a program to swap two variables values with and without using third variables
5. Write a program to check odd or even number (a) using modulus operator (b) using bitwise operator (c) without using bitwise and modulus operator (d) using conditional operator.
6. Write a program to illustrate the use of unary prefix and postfix increment and decrement operators.
7. Write a program to find the largest of three numbers using ternary operators (Conditional operator).
8. Write a program to print the size of int, char, float, double and long double data types in C

Lab Exercise 3

Formatted and Unformatted I/O

Objective:

- To be familiar with formatted and unformatted I/O in C with preprocessor directives

Title:

- Write a program to do the following

a. Define the math operator '+' as PLUS, '-' as MINUS, '*' as MULT & '/' as DIVIDE using preprocessor directives and do the operations over variables (x, y) defined on like z=x PLUS y.

Code:

```
#include<stdio.h>
#include<conio.h>
#define PLUS +
#define MINUS -
#define MULT *
#define DIVIDE /
void main()
{
   int a,b,res;
   printf("Enter value a and b: ");
   scanf("%d%d",&a,&b);
   res = a PLUS b;
   printf("\nAddition = %d",res);
   res = a MINUS b;
   printf("\nSubtraction= %d",res);
   res = a MULT b;
   printf("\nMultiplication = %d",res);
   res = a DIVIDE b;
   printf("\nDivision = %d",res);
   getch();
}
```

Output:

```
Enter value a and b: 1
2
Addition = 3
Subtraction= -1
Multiplication = 2
Division = 0
```

b. Write a program to take gender as M or F and display it using unformatted I/O.

Code:

```
#include<stdio.h>
#include<conio.h>
void main()
{
  char gender;
  printf("Enter gender M or F: ");
  gender = getchar();
  printf("The entered gender is  ");
  putchar(gender);
  getch();
}
```

Output:

```
Enter gender M or F: M
The entered gender is M
```

c. Get input of your name, address, age in years, weight and height from keyboard and display the information using unformatted I/O (String I/O).

Code:

```
#include<stdio.h>
#include<conio.h>
void main()
{
```

```
  char name[10];
  char address[10];
  char age[10];
  char weight[10];
  char height[10];
  printf("Enter name: ");
  gets(name);
  printf("Enter address: ");
  gets(address);
  printf("Enter age: ");
  gets(age);
  printf("Enter weight: ");
  gets(weight);
  printf("Enter height: ");
  gets(height);
  printf("\n*****Your Information*****");
  printf("\nName: ");
  puts(name);
  printf("\nAddress: ");
  puts(address);
  printf("\nAge: ");
  puts(age);
  printf("\nWeight: ");
  puts(weight);
  printf("\nHeight: ");
  puts(height);
  getch();
}
```

Output:

```
Enter name: Ram Bist
Enter address: Dhangadhi
Enter age: 15 yrs
Enter weight: 65 kg
Enter height: 5.6" inch
*****Your Information*****
Name: Ram Bist
Address: Dhangadhi
Age: 15 yrs
Weight: 65 kg
Height: 5.6" inch
```

d. Demonstrate the differences among getch(), getche(), getchar().

Code:

```
#include<stdio.h>
#include<conio.h>
void main()
{
   char ch;
   printf("Enter Character first: ");
   ch = getchar();
   printf("First Character is %c",ch);
   printf("\nEnter Character second: ");
   ch = getch();
   printf("\nSecond Character is %c",ch);
   printf("\nEnter Character third: ");
   ch = getche();
   printf("\nThird Character is %c",ch);
   getch();
}
```

Output:

Enter Character first: J

First Character is J

Enter Character second:

Second Character is K

Enter Character third: L

Third Character is L

Lab Exercises (Please Code yourself and show the output to instructor):

1. Write a program to produce the output as shown below:

x	y	expressions	results
6	3	x=y+3	x=6
6	3	x=y-2	x=1
6	3	x=y*5	x=15
6	3	x=x/y	x=2
6	3	x=x%y	x=0

2. Given x=3.0, y=12.5, z= 523.3, A=300.0, B=1200.5, C=5300.3, Write a program to display the following:

```
X    y    z=      3.0|    12.5|    523.3|
A    B    C=    300.0|  1200.5|   5300.3|
---------------------------------------------------------------------
X    y    z=    |3.00        |12.50     |523.30
A    B    C=    |300.00      |1200.50   |52300.30
```

3. Given the three numbers a(=8), b(=4),c and constant value PI=3.1415, calculate and display the following result using macros (preprocessor directives)

a. c = PI * mult(a,b) //the macro mult(a,b) perform the multiplication of a & b(a*b)

b. c= PI* sum(a,b) //the macro mult(a,b) perform the sum of a & b (a+b)

c. c= PI *sub(a,b) //the macro mult(a,b) perform the subtraction of a & b (a-b)

d. c= PI*div(a,b) //the macro mult(a,b) perform the division of a & b (a/b)

Lab Exercise 4

Decision or Conditional Statement

Objective:

- To understand the programming knowledge using Decision Statements (if, if-else, if elseif ladder, switch and GOTO)

Title:

- Write a program to input marks of 5 subjects (Physics, Chemistry, Math, English& Biology) for a student. Display the result of total marks and percentage obtained with his/her rank in the class. The rank is categorized as fail (marks < 40%), pass & third division (marks between 40 to 55%), second (marks between 55 to 65%), first (marks between 65 to 80%), Distinction (marks between 80 to 95%), extra ordinary (marks above 95 to 100%).

Code:

```
#include<stdio.h>
#include<conio.h>
void main()
{
   int phy, che, math, eng, bio, total;
   float per ;
   printf("Enter marks of 5 subjects:\n");
   scanf("%d%d%d%d%d", &phy,&che,&math,&eng,&bio);
   total = che + phy + math + eng + bio;
   per = total/5;
   if(per<40)
      printf("Fail: %4.2f%%",per);
   else if(per>=40 && per<55)
      printf("Third division: %4.2f%%",per);
   else if(per>=55 && per<65)
      printf("Second division: %4.2f%%",per);
   else if(per>=65 && per<80)
      printf("First division: %4.2f%%",per);
```

```
        else if(per>=80 && per<95)
            printf("Distinction: %4.2f%%",per);
        else
            printf("Extra Ordinary: %5.2f%%",per);
        getch();
    }
```

Output:

Enter marks of 5 subjects:

50

40

60

70

85

Second division: 61.00%

Lab Exercises (Please Code yourself and show the output to instructor):

1. Write a program to find the largest and smallest among three entered numbers and also display whether the identified largest/smallest number is even or odd.
2. Write a program to check whether input alphabet is vowel or not using if-else and switch statement.
3. Write a program to get input of two or higher digit integer number and display in reverse order.
4. Write a program that asks a number and test the number whether it is multiple of 5 or not, divisible by 7 but not by eleven.
5. Write a program to check whether the entered year is leap year or not (a year is leap if it is divisible by 4 and divisible by 100 or 400.)
6. Write a program to read the values of coefficients a, b and c of a quadratic equation $ax^2+bx+c=0$ and find roots of the equation.

Lab Exercise 5

Iteration or Looping Statement

Objective:

- To understand the programming using Loop & nested loop Statements (for, while, do-while, nested loop)

Title:

- Write a program to print numbers from 1 to 10 using for, while and do while loop.

Code:

```
#include<stdio.h>
#include<conio.h>
void main()
{
   int i;
   printf("Numbers are from 1 to 10:\n");
   //using for loop
   for(i=1;i<=10;i++)
      printf("%d\n",i);
   //using while loop
   i=1;
   while(i<=10)
   {
      printf("%d\n",i);
      i++;
   }
   //using do while loop
    i=1;
   do
   {
      printf("%d\n",i);
      i++;
   }while(i<=10);
   getch();
}
```

Output:

```
1
2
3
4
5
6
7
8
9
10
```

- Write a program to display following pattern

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

Code:

```
#include<stdio.h>
#include<conio.h>
void main()
{
   int i, j, rows;
   printf("Enter number of rows: ");
   scanf("%d", &rows);
   for (i=1; i<=rows; ++i)
   {
      for (j=1; j<=i; ++j)
      {
         printf("* ");
      }
      printf("\n");
   }
   getch();
}
```

Lab Exercises (Please Code yourself and show the output to instructor):

1. Write a program to input two integer numbers and display the sum of even numbers between these two input numbers.
2. Write a program to find GCD (greatest common divisor or HCF) and LCM (least common multiple) of two numbers.
3. Write a program to display Fibonacci series.
4. Write a program to count number of digits in a given integer.
5. Write a program to check whether a number is Palindrome or not.
6. Write a program to display prime number from 1 to 50.
7. Write a program to print following pattern.

1	A	* * * * *	1 2 3 4 5	1
1 2	B B	* * * *	1 2 3 4	2 3
1 2 3	C C C	* * *	1 2 3	4 5 6
1 2 3 4	D D D D	* *	1 2	7 8 9 10
1 2 3 4 5	E E E E E	*	1	

Lab Exercise 6

Array

Objective:

- To understand programming using different dimensions of Array.

Title:

- Write a program to insert 5 elements into an array and print the elements the array.

Code:

```
#include<stdio.h>
#include<conio.h>
void main()
{
   int n[5],i;
   printf("Enter 5 numbers: ");
   for (i=0; i<5; ++i)
   {
      scanf("%d", &n[i]);
   }
   printf("Entered Array Elements are: ");
   for (i=0; i<5; ++i)
   {
      printf("%d\t", n[i]);
   }
   getch();
}
```

Output:

Enter 5 numbers: 1 2 3 4 5

Entered Array Elements are: 1 2 3 4 5

Lab Exercises (Please Code yourself and show the output to instructor):

1. Write a Program to Search an element in array.
2. Write a Program to perform addition of all elements in Array.
3. Write a Program to find the largest and smallest element in Array.
4. Write a Program to reverse the array elements in C Programming.
5. Write a Program for deletion of an element from the specified location from Array.
6. Write a Program to access an element in 2-D Array.
7. Write a program for addition of two matrices of any order in C.
8. Write a Program to multiply two 3 X 3 Matrices.
9. Write a program to read a string and check for palindrome without using string related function (a string is palindrome if its half is mirror by itself eg: abcdcba).

Lab Exercise 7
String Functions

Objective:

- To understand different string functions.

Title:

- Write a program to check given string is palindrome or not.

Code:

```
#include<stdio.h>
#include<conio.h>
#include<string.h>
void main()
{
   int d;
   char str[10],temp[10];
   printf("Enter a String:");
   gets(str);
   strcpy(temp,str);
   d = strcmp(temp,strrev(str));
   if (d == 0)
   printf(" %s is Palindrome.", str);
   else
      printf("%s is not palindrome.",str);
   getch();
}
```

Output:

```
Enter a String: wow
 wow is Palindrome.
```

Lab Exercises (Please Code yourself and show the output to instructor):

1. Write a program to accept a string and count the number of vowels present in this string.
2. Write a program to input 5 names and sort them.
3. Write a program to concatenate two strings.
4. Write a program to compare two strings.
5. Write a program to input a string and convert all lowercase letters to uppercase and vice-versa.

6. Write a program which accepts string “NAST” and print as follows.

N	N	NAST
AA	NA	NAS
SSS	NAS	NA
TTTT	NAST	N

Lab Exercise 8

Function Programming

Objective:

- To understand function programming, its types and function-call

Title:

- Write a program to calculate factorial of a number using recursion.

Code:

```
#include<stdio.h>
#include<conio.h>
int fact(int);
void main()
{
   int x,n;
   printf(" Enter the Number to Find Factorial :");
   scanf("%d",&n);
   x=fact(n);
   printf(" Factorial of %d is %d",n,x);
   getch();
}
int fact(int n)
{
   if(n==0)
      return(1);
   else
      return(n*fact(n-1));
}
```

Output:

Enter the Number to Find Factorial :5

Factorial of 5 is 120

Lab Exercises (Please Code yourself and show the output to instructor):

1. Write a program to add, subtract, multiply and divide two integers using user defined type function with return type.
2. Write a program to calculate sum of first 20 natural numbers using recursive function.
3. Write a program to generate Fibonacci series using recursive function.
4. Write a program that illustrates use of local, global and static variables.
5. Write a C program to find maximum and minimum between two numbers using functions.
6. Write a C program to check whether a number is even or odd using functions.
7. Write a C program to find power of any number using recursion.
8. Write a program to input n number in array and display it in reverse order using function.
9. Write a program to input number in array and sort them using function.
10. Write a program to input number in array and sort find the highest element using function

Lab Exercise 9

Pointers

Objective:

- To understand programming with Pointer, String and Function call by reference.

Title:

- Write a program to find biggest among three numbers using pointer.

Code:

```
#include<stdio.h>
#include<conio.h>
void main()
{
  int num1, num2, num3;
   int *p1, *p2, *p3;
```

```
//taking input from user
printf("Enter three Number: ");
scanf("%d%d%d",&num1,&num2,&num3);

//assigning the address of input numbers to pointers
p1 = &num1;
p2 = &num2;
p3 = &num3;
if(*p1 > *p2)
{
   if(*p1 > *p3)
   {
      printf("%d is the largest number", *p1);
   }
   else
   {
      printf("%d is the largest number", *p3);
   }
}
else
{
   if(*p2 > *p3)
   {
      printf("%d is the largest number", *p2);
   }
   else
   {
      printf("%d is the largest number", *p3);
   }
}
```

```
    getch();
}
```

Output:

```
Enter three Number: 1 2 3
3 is the largest number
```

Lab Exercises (Please Code yourself and show the output to instructor):

1. Write a program to find the sum of all the elements of an array using pointers.
2. Write a program to swap value of two variables using pointer.
3. Write a program to add two numbers using pointers.
4. Write a program to input and print array elements using pointer.
5. Write a program to copy one array to another using pointer.
6. Write a program to swap two arrays using pointers.
7. Write a program to reverse an array using pointers
8. Write a program to find length of string using pointers.
9. Write a program to copy one string to another using pointer.
11. Write a program to swap two integers using call by value and call by reference methods of passing arguments to a function.
12. Write a program to input n number in array and find sum of all elements dynamically.

Lab Exercise 10

Structure and Union

Objective:

- To understand programming with Structure and Union.

Title:

- Write a C program to create, declare and initialize structure.

Code:

```
#include<stdio.h>
#include<conio.h>
 /*structure declaration*/
struct employee
{
   char name[30];
   int empId;
```

```
    float salary;
 };
void main()
{
 /*declare and initialization of structure variable*/
    struct employee emp={"Anil",201,80000.00};
    printf("\n Name: %s" ,emp.name);
    printf("\n Id: %d"  ,emp.empId);
    printf("\n Salary: %.2f\n",emp.salary);
    getch();
}
```

Output:

Name: Anil

Id: 201

Salary: 80000.00

- Write a C program to create, declare and initialize union.

Code:

```
#include <stdio.h>
 // union declaration
  union pack
  {
     char a;
     int b;
     double c;
  };
int main()
 {
     union pack p;
      //union object/variable declaration
     printf("\nOccupied size by union pack: %d",sizeof(p));
       // assign value to each member one by one other it will
replace last value
     p.a='A';
     printf("\nValue of a:%c",p.a);
     p.b=10;
     printf("\nValue of b:%d",p.b);
     p.c=12345.6790;
```

```
    printf("\nValue of c:%f",p.c);

 // see, what will happen? if u will assign values together
    p.a='A';
    p.b=10;
    p.c=12345.6790;
  // here the last value of p.c will be accessed by all members
   printf("\nValue of a:%c, b:%d, c:%f",p.a,p.b,p.c);
   return 0;
}
```

Output:

```
Occupied size by union pack: 8
Value of a:A
Value of b:10
Value of c:12345.679000
Value of a:■, b:-377957122, c:12345.679000
```

Lab Exercises (Please Code yourself and show the output to instructor):

1. Write a program to read RollNo, Name, Address, Age & marks in English, C, math in 1st semester of three students and display the student details with average marks achieved.
2. Create a structure named company which has name, address, phone and noOfEmployee as member variables. Read name of company, its address, phone and noOfEmployee. Finally display these members' value.
3. Write a program to enter to Cartesian coordinate points and display the distance between them.
4. Define a structure "complex" (typedef) to read two complex numbers and perform addition, subtraction of these two complex numbers and display the result.

Lab Exercise 11

File handling in C

Objective:

- To understand data files and file handling in C

Title:

- Write a program to input age, gender, marks of student in file called 'student.txt'. And, display the student information.

Code:

```
#include<stdio.h>
#include<conio.h>
#include<stdlib.h>
void main()
{
   int age;
   char g;
   float marks;

   FILE *fp;
   fp = fopen("student.txt","w+");
   if(fp==NULL)
   {
      printf("File Could not be opened.");
      getch();
      exit(0);
   }

   printf("Enter gender:");
   scanf("%c",&g);
   printf("Enter age:");
   scanf("%d",&age);
   printf("Enter marks:");
```

```
    scanf("%f",&marks);
    fprintf(fp,"Age=%d\tGender=%c\tMarks=%f",age,g,marks);
    rewind(fp);
    fscanf(fp,"%d%c%f",&age,&g,&marks);
    printf("Age=%d\nGender=%c\nMarks=%f",age,g,marks);
    fclose(fp);
    getch();
}
```

Output:

```
Enter gender:M
Enter age:15
Enter marks:2.5
Age=15
Gender=M
Marks=2.500000
```

Lab Exercises (Please Code yourself and show the output to instructor):

1. Write characters into a file “filec.txt”. The set of characters are read form the keyboard until an enterkey is pressed (use putc() and getc() function).
2. Read characters from file “filec.txt” created in question 1. Also count the number of characters in the file (use fputs() and fgets() function).
3. Write set of strings each of length 40 into a file “stringc.txt” and display it (use fputs() and fgets() function).
4. Write name, age and height of a person into a data file “person.txt” and read it (use fprintf() and fscanf() function).
5. Create a structure called student having name, age and rollno. Input a record, store it in a file called ‘student.txt’ and display the student information.