Lab Assignment 1: Introduction to C Programming

CS-153 Computer Programming Lab

Autumn Semester, 2016, IIT Indore

Date: 01-08-16

Introduction to #include, printf, scanf, variables, expression, if statement, if else statement, main(), return() and data types: integer, float, and char. **Introduction to programming standards**: *Line length limit*, *Comments*, *Variable names*, *Indentation*, *Braces*, *Position of* **main ( )**, *Declarations*, *Position of variable declarations*.

Note: Write following programs in C language. Also note that this assignment will be evaluated by TA's in the upcoming labs of next week (08-08-16 onward) for each batch.

1. Write a program to print "Hello World" on screen.

2. Write a program to input two integers and print their sum.

3. Write a program to input length and breadth of a rectangle. Calculate and print area and perimeter of the rectangle.

4. Write a program to input a number and print whether it is odd or even.

5. Write a program to input a 5-digit integer through keyboard, and obtain the reverse number. Print whether the original and reverse numbers are equal or not. If not, print the greater one.

6. If cost price and selling price of an item is input through the keyboard, write a program to determine whether the seller has made profit or incurred loss. Also determine how much profit he made or loss he incurred.

7. If the ages of Ram, Shyam and Ajay are input through the keyboard, write a program to determine the youngest of the three.

8. Write a program to find the greatest of the three numbers entered through the keyboard using conditional operators.

9. Write a program to find the value of one number raised to the power of another.

10. Write a program to print all the ASCII values and their equivalent characters using a while loop. The ASCII values vary from 0 to 255.

Lab Assignment 2: Loops, Case Control and Array: C Programming

CS-153 Computer Programming Lab

Autumn Semester, 2016, IIT Indore

Date: 09-08-16

Note: Write following programs in C language. Also note that this assignment will be evaluated by TA's in the upcoming labs of next week (15-08-16 onward) for each batch.

1. Write a program to compute an integer y such that y is produced by reversing x (using loop). For example, if x is 6787, y is 7876, and if x is 80, y is 8.

2. Fibonacci numbers are the numbers in the following integer sequence: 0,1,1,2,3,5,8,13,21... By definition, the first two Fibonacci numbers are 0 and 1, and each subsequent number is the sum of the previous two numbers. Write a program (using loop) to compute nth number in this series for given input n.

3. Write a menu driven program (using switch case) which has following options:

1. Factorial of a number.
2. Prime or not
3. Odd or even
4. Exit

4. Write a program to find average marks (using array) obtained by a class of 30 students in a test.

5. Write a program to find out the frequency of occurrence of a given value v inside an array of size N. Read N, the actual numbers in the array, and value v from the keyboard before you compute the frequency.

6. Given an array of integers of size n, find out if the numbers in the array appear in a palindrome order. A palindrome is a sequence that reads the same when you flip it. For example, 121 is a palindrome, 3 is a palindrome, and 234432 is also a palindrome

Practice Set 1: Introduction to C Programming

CS-153 Computer Programming Lab

Autumn Semester, 2016, IIT-Indore

A **control statement** determines whether other statements will be executed or not. Example of control statements are if statement, loop statements (while, do-while and for) and switch statement.

Section 1: *if, if-else,* nested *if-else*

1. Given the length and breadth of a rectangle, write a program to find whether the area of the rectangle is greater than its perimeter. For example, the area of the rectangle with length = 5 and breadth = 4 is greater than its perimeter. Given three points (x1, y1), (x2, y2) and (x3, y3), write a program to check if all the three points fall on one straight line.

2. Given the coordinates (x, y) of a center of a circle and it's radius, write a program which will determine whether a point lies inside the circle, on the circle or outside the circle.
   (Hint: Use sqrt( ) and pow( ) functions).

3. Any character is entered through the keyboard; write a program to determine whether the character entered is a capital letter, a small case letter, a digit or a special symbol. The following table shows the range of ASCII values for various characters.

Characters	**ASCII Values**
A – Z	65 – 90
a – z	97 – 122
0 – 9	48 – 57
special symbols	0 - 47, 58 - 64, 91 - 96, 123 – 127

4. An Insurance company follows following rules to calculate premium.
   a. If a person's health is excellent and the person is between 25 and 35 years of age and lives in a city and is a male then the premium is Rs. 4 per thousand and his policy amount cannot exceed Rs. 2 lakhs.
   b. If a person satisfies all the above conditions except that the sex is female then the premium is Rs. 3 per thousand and her policy amount cannot exceed Rs. 1 lakh.
   c. If a person's health is poor and the person is between 25 and 35 years of age and lives in a village and is a male then the premium is Rs. 6 per thousand and his policy cannot exceed Rs. 10,000.
   d. In all other cases the person is not insured.
   Write a program to output whether the person should be insured or not, his/her premium rate and maximum amount for which he/she can be insured.

5. A certain grade of steel is graded according to the following conditions:

   a. Hardness must be greater than 50
   b. Carbon content must be less than 0.7

c. Tensile strength must be greater than 5600

The grades are as follows:

Grade is 10 if all three conditions are met
Grade is 9 if conditions (i) and (ii) are met
Grade is 8 if conditions (ii) and (iii) are met
Grade is 7 if conditions (i) and (iii) are met
Grade is 6 if only one condition is met
Grade is 5 if none of the conditions are met

Write a program, which will require the user to give values of hardness, carbon content and tensile strength of the steel under consideration and output the grade of the steel.

6. A library charges a fine for every book returned late. For first 5 days the fine is 50 paise, for 6-10 days fine is one rupee and above 10 days fine is 5 rupees. If you return the book after 30 days your membership will be cancelled. Write a program to accept the number of days the member is late to return the book and display the fine or the appropriate message.

7. If the three sides of a triangle are entered through the keyboard, write a program to check whether the triangle is isosceles, equilateral, scalene or right angled triangle.

8. In a company, worker efficiency is determined on the basis of the time required for a worker to complete a particular job. If the time taken by the worker is between 2–3 hours, then the worker is said to be highly efficient. If the time required by the worker is between 3–4 hours, then the worker is ordered to improve speed. If the time taken is between 4–5 hours, the worker is given training to improve his speed, and if the time taken by the worker is more than 5 hours, then the worker has to leave the company. If the time taken by worker is input through the keyboard, find the efficiency of the worker.

9. A university has the following rules for a student to qualify for a degree with A as the main subject and B as the subsidiary subject:
a. He should get 55 percent or more in A and 45 percent or more in B.
b. If he gets than 55 percent in A, he should get 55 percent or more in B. However, he should get at least 45 percent in A.
c. If he gets less than 45 percent in B and 65 percent or more in A, he is allowed to reappear in an examination in B to qualify.
d. In all other cases he is declared to have failed. Write a program to receive marks in A and B and Output whether the student has passed, failed or is allowed to reappear in B.

10. Policy followed by a company to process customer orders is given by the following rules:
a. If a customer order is less than or equal to that in stock and has credit is OK, supply has requirement.
b. If has credit is not OK do not supply. Send him intimation.
c. If has credit is Ok but the item in stock is less than has order, supply what is in stock. Intimate to him data the balance will be shipped.
Write a C program to implement the company policy.

Reference: Questions are taken from "*Let us C*" by *Yashwant Kanetkar*

Section 2: ***Conditional operators*** **(? :)** is a ternary operator which takes three operands

1. What would be the output of the following programs:

(a)
```
main() {
    int i = -4, j, num;
    j = (num < 0 ? 0 : num * num);
    printf("\n%d", j);
}
```

(b)
```
main() {
    int k, num = 30;
    k = (num > 5 ? (num <= 10 ? 100 : 200) : 500);
    printf("\n%d", num);
}
```

(c)
```
main() {
    int j = 4;
    (!j != 1 ? printf("\nWelcome") : printf("\nGood Bye"));
}
```

2. Rewrite the following programs using conditional operators.

(a)
```
main() {
    int x, min, max;
    scanf("\n%d %d",  & max,  & x);
    if (x > max) {
       max = x;
    } else {
       min = x;
    }
}
```

(b)
```
main() {
    int code;
    scanf("%d",  & code);
    if (code > 1) {
       printf("\nJerusalem");
    } else if (code < 1) {
       printf("\nEddie");
    } else {
       printf("\nC Brain");
    }
}
```

(c)
```
main() {
        float sal;
        printf("Enter the salary");
        scanf("%f",  & sal);
        if (sal < 40000 && sal > 25000) {
           printf("Manager");
        } else {
           if (sal < 25000 && sal > 15000) {
              printf("Accountant");
           } else {      printf("Clerk");
           }
        }
     }
```

3. Using conditional operators determine:
   a. Whether the character entered through the keyboard is a lower case alphabet or not.
   b. Whether a character entered through the keyboard is a special symbol or not.

4. Write a program using conditional operators to determine whether a year entered through the keyboard is a leap year or not.

Reference: Questions are taken from "*Let us C*" by *Yashwant Kanetkar*

Section 3: for and/or **while**

1. Write a program to calculate overtime pay of 10 employees. Overtime is paid at the rate of Rs. 12.00 per hour for every hour worked above 40 hours. Assume that employees do not work for fractional part of an hour.
2. Write a program to find the factorial value of any number entered through the keyboard. Two numbers are entered through the keyboard.
3. Write a program to find the value of one number raised to the power of another.
4. Write a program to print all the ASCII values and their equivalent characters using a while loop. The ASCII values vary from 0 to 255.

Section 4: loop that needs **do-while, break** and/or **continue**

1. An expression contains relational operators, assignment operators, and arithmetic operators. In the absence of parentheses, they will be evaluated in which of the following order:
   1. assignment, relational, arithmetic
   2. arithmetic, relational, assignment
   3. relational, arithmetic, assignment
   4. assignment, arithmetic, relational
2. The break statement is used to exit from:
   1. an if statement
   2. a for loop
   3. a program
   4. the main( ) function
3. A do-while loop is useful when we want that the statements within the loop must be executed:
   1. Only once
   2. At least once
   3. More than once
   4. None of the above
4. In what sequence the initialization, testing and execution of body is done in a do-while loop
   1. Initialization, execution of body, testing
   2. Execution of body, initialization, testing
   3. Initialization, testing, execution of body
   4. None of the above.
5. Write a program to print all prime numbers from 1 to 300. (Hint: Use nested loops, break and continue)
6. Write a program to fill the entire screen with a smiling face. Smiling face has an ASCII value 1.

Reference: Questions are taken from "*Let us C*" by *Yashwant Kanetkar*

```
#include <stdio.h>

int main()
{
    int num = 6787;
      int rev_num = 0;

      while(num > 0)
    {
        rev_num = rev_num*10 + num%10;
        num = num/10;
    }

    printf("Reverse of no. is %d", rev_num);

    getchar();
    return 0;
}
```

```
/*
 * C program to generate and print first N FIBONACCI numbers
 * in the series.
 */
#include <stdio.h>

void main()
{
    int fib1 = 0, fib2 = 1, fib3, num, count = 0;

    printf("Enter the value of num \n");
    scanf("%d", &num);
    printf("First %d FIBONACCI numbers are ...\n", num);
    printf("%d\n", fib1);
    printf("%d\n", fib2);
    count = 2; /* fib1 and fib2 are already used */
    while (count < num)
    {
        fib3 = fib1 + fib2;
        count++;
        printf("%d\n", fib3);
        fib1 = fib2;
        fib2 = fib3;
   }
}
```

```
main( )
{
   int choice ;
   while ( 1 )
   {
      printf ( "\n1. Factorial" ) ;
      printf ( "\n2. Prime" ) ;
      printf ( "\n3. Odd/Even" ) ;
      printf ( "\n4. Exit" ) ;
      printf ( "\nYour choice? " ) ;
      scanf ( "%d", &choice ) ;
      switch ( choice )
      {
         case 1 :
         /* logic for factorial of a number */
         break ;
         case 2 :
         /* logic for deciding prime number */
         break ;
         case 3 :
         /* logic for odd/even */
         break ;
         case 4 :
         exit( ) ;
      }
   }
}
```

```
#include<stdio.h>

main( )
{
    int avg, sum = 0 ;
    int i ;
    int marks[30] ; /* array declaration */

    for ( i = 0 ; i <= 29 ; i++)
    {
            printf ( "\nEnter marks " ) ;
            scanf ( "%d", &marks[i] ) ; /* store data in array */
    }

    for ( i = 0 ; i <= 29 ; i++ )
    sum = sum + marks[i] ; /* read data from an array*/

    avg = sum / 30 ;
    printf ( "\nAverage marks = %d", avg ) ;
}
```

```
#include<stdio.h>

int main()
{
  int array[];
  int i, N, v, frequency=0;
  printf("Enter the size of the array\n");
  scanf("%d",&N);
  printf("Enter %d numbers\n", N);
  for(i=0;i<N;i++)
    {
      scanf("%d",&array[i]);
    }
  printf("Enter the value for which frequency is to be computed\n");
  scanf("%d", &v);
  for(i=0; i<N; i++)
    {
      if(array[i]==v)
      {
        frequency++;
      }
    }
  printf("The frequency is %d", frequency);
}
```

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

int main()
{
  int n, reverse = 0, temp;

  printf("Enter a number to check if it is a palindrome or not\n");
  scanf("%d",&n);

  temp = n;

  while( temp != 0 )                    // temp is descreases with least significant digit.
  {
    reverse = reverse * 10;              // reverse is multiplied with 10.
    reverse = reverse + temp%10;         // find out the least significant digit to add with
the reverse. Store the value in reverse again.
    temp = temp/10;                      // temp is descreased with a least significant  digit.
  }

  if ( n == reverse )                   // if given number n is equal to reverse then
palindrome otherwise not.
    printf("%d is a palindrome number.\n", n);
  else
    printf("%d is not a palindrome number.\n", n);

  getch();
  return 0;
}
```