List of Programs

PCS151: Programming in C Lab

Instructions:

1. Your code should be well documented wherever necessary.
2. Code should be clean and optimal (using best possible approach).
3. Document at least three sample test cases for each of the programs.

Problems

1. A farmer wants to fence with 'P' rounds of wire in his rectangular plot of length 'L' meters and breadth 'B' meters. Calculate the total wire to be purchased. If the cost per meter of wire is 'T' rupees, also calculate the total cost of fencing. Write an algorithm, draw a flowchart. Write a C program for the above problem by providing the test data and documenting the sample output.

Sample Test Data

Input	Output
Enter the number of rounds (P): 3 Enter the length and Breadth of the plot (L & B): 12 24 Enter the cost of fencing (T) : 20	Total wire to be purchased (in Meter) : 216 Total Cost of Fencing (in Rs): 4320
Enter the number of rounds (P): 2 Enter the length and Breadth of the plot (L & B): 15 25 Enter the cost of fencing (T) : 15	Total wire to be purchased (in Meter) : 160 Total Cost of Fencing (in Rs): 2400
Enter the number of rounds (P): 5 Enter the length and Breadth of the plot (L & B): 25 40 Enter the cost of fencing (T) : 25	Total wire to be purchased (in Meter) : 650 Total Cost of Fencing (in Rs): 16250

2. Write an algorithm and draw a flowchart to convert a decimal number (base 10) to its Hexadecimal (Base 16), Binary (Base 2) and Octal (Base 8) equivalents. Write a C program for the same by providing the test data and documenting the sample output.

Sample Test Data

Input	Output
Enter the Decimal Number(Base 10) : 129	Hexadecimal equivalent of 129 is : 81 Binary Equivalent of 129 is : 10000001 Octal Equivalent of 129 is : 201
Enter the Decimal Number(Base 10) : 555	Hexadecimal equivalent of 555 is : 22B Binary Equivalent of 555 is : 1000101011

	Octal Equivalent of 555 is : 1053
Enter the Decimal Number(Base 10) : 185	Hexadecimal equivalent of 185 is : B9 Binary Equivalent of 185 is : 10111001 Octal Equivalent of 185 is : 271

3. Write an algorithm and draw a flowchart to test whether a given number is even or odd. Write a C program for the same by providing the test data and documenting the sample output. Implement using :

    a. switch-case statement
    b. Conditional/Ternary operator

Sample Test Data

Input	Output
Enter the number : 3	The number (3) is Odd (Switch Case) The number (3) is Odd (Ternary operator)
Enter the number : 30	The number (30) is Even (Switch Case) The number (30) is Even (Ternary operator)
Enter the number : 56	The number (56) is Even (Switch Case) The number (56) is Even (Ternary operator)

4. Write an algorithm and draw a flowchart to calculate the area of a valid triangle using Heron's Formula (Sum of any two sides must be greater than the third side). Write a C program for the same by providing the test data and documenting the sample output.

Sample Test Data

Input	Output
Enter the sides of Triangle (A, B, C): 3 4 5	The area of the Triangle is : 6
Enter the sides of Triangle (A, B, C): 10 11 15	The area of the Triangle is : 54.99
Enter the sides of Triangle (A, B, C): 5 5 11	The area of the Triangle is : Not Possible

5. Write an algorithm and draw a flowchart to calculate and display the grade of a student by accepting the percentage in 6 subjects as per the following criteria:
    a) Percentage > 80 then Grade = A
    b) Percentage between 61 & 80 then Grade = B
    c) Percentage between 51 & 60 then Grade = C
    d) Percentage between 41 & 50 then Grade = D
    e) Percentage between 35 & 40 then Grade = E
    f) Percentage < 35 then Grade = F

Write a C program for the above problem by giving the sample test data as input and documenting the output.

Sample Test Data

Input	Output
Enter marks in six Subjects: 55 48 69 41 89 74	The Grade of the Student is: B
Enter marks in six Subjects: 12 15 25 42 08 14	The Grade of the Student is: F
Enter marks in six Subjects: 97 79 95 99 89 98	The Grade of the Student is: A

6. Write an algorithm and draw a flowchart to find the average of top three test results out of four conducted. Write a C program for the problem by giving the sample test data as input and documenting the output. [Hint: eliminate the smallest one].

Sample Test Data

Input	Output
Enter results of Four Tests: 75 72 79 69	The average of best three test results is : 75.33
Enter results of Four Tests: 25 70 99 73	The average of best three test results is : 80.67
Enter results of Four Tests: 65 33 89 83	The average of best three test results is : 79.00

7. Write an algorithm and draw a flowchart to determine the year accepted from the user is leap year or not using Logical AND, OR operators and conditional statements. Write a C program for the above problem by giving the sample test data as input and documenting the output.

Sample Test Data

Input	Output
Enter the Year: 1920	The inputted Year (1920) is a Leap Year
Enter the Year: 1955	The inputted Year (1955) is not a Leap Year
Enter the Year: 1900	The inputted Year (1900) is not a Leap Year

8. Write an algorithm and draw a flowchart to sum the individual digits of a four-digit positive number N accepted from the user. Write a C program for the above problem by giving the sample test data as input and documenting the output.

Sample Test Data

Input	Output
3	

Enter the Number: 8569	The sum of digits of 8569 is : 28
Enter the Number: 5555	The sum of digits of 5555 is : 20
Enter the Number: 1500	The sum of digits of 1500 is : 6

9. Write a C program to add two numbers without using arithmetic operations. [Hint: use bitwise operators]

   Input Format:
   First input line will take first number.
   Second input line will take second number.

   Output Format:
   Output will be result of addition of these two numbers.

   Sample Test Data

Input	**Output**
Enter first number : 4 Enter second number : 63	Addition of 4 and 63 is : 67

10. Write a C program using functions to find the permutation of two numbers (i. e. P (m, n)). [Hint: use a function for factorial of a number]

Sample Test Data

Input	**Output**
3	

Enter two Numbers : 12 5	The permutation P(12, 5) is : 95040
Enter two Numbers : 8 3	The permutation P(8, 3) is : 336
Enter two Numbers : 10 12	The permutation P(10, 12) is : Not Possible

11. Write a C program to find **N** Fibonacci numbers using iterative and recursive function. Accept the value of N in the main program.

Sample Test Data

Input	**Output**
3	

Enter the Number: 10	The 10th Fibonacci number is 34 (Using Recursion) The 10th Fibonacci number is 34 (Using Iteration)
Enter the Number: 5	The 5th Fibonacci number is 3 (Using Recursion) The 5th Fibonacci number is 3 (Using Iteration)

Enter the Number: 15	The 15th Fibonacci number is 377 (Using Recursion) The 15th Fibonacci number is 377 (Using Iteration)

12. Design a function to print the pattern shown below by accepting the number of rows from the user in the main program. Implement the function using a C program.

Sample Test Data

Input	**Output**
3	

Enter the Number of rows: 5	The Corresponding Pattern is * * * * * * * * * * * * * * *
Enter the Number of rows: 3	The Corresponding Pattern is * * * * * *
Enter the Number of rows: 7	The Corresponding Pattern is *

13. Design a function that returns the frequency of character ‘G’ or ‘g’ (Ignore Case) in a stream of **N** characters. Accept the value of **N** and display the frequency in the main program.

Sample Test Data

Input	**Output**
3	

Enter the String: G r e a t e r g a t e G l o r y	Frequency of letter(G or g): 3
Enter the String: GRAPHIC ERA HILL UNIV	Frequency of letter(G or g): 1
Enter the String: Dehradun	Frequency of letter(G or g): 0

14. Write a program in C to find Greatest Common Divisor (GCD) and Least Common Multiplier (LCM) of two numbers using recursive and iterative versions.

Sample Test Data

Input	Output
3	

Enter two Numbers : 15 20	LCM of 15 and 20 is : 60 (Using Recursion) LCM of 15 and 20 is : 60 (Using Iteration) GCD of 15 and 20 is : 5 (Using Recursion) GCD of 15 and 20 is : 5 (Using Iteration)
Enter two Numbers : 52 25	LCM of 52 and 25 is : 1300 (Using Recursion) LCM of 52 and 25 is : 1300 (Using Iteration) GCD of 52 and 25 is : 1 (Using Recursion) GCD of 52 and 25 is : 1 (Using Iteration)
Enter two Numbers : 35 35	LCM of 35 and 35 is : 35 (Using Recursion) LCM of 35 and 35 is : 35 (Using Iteration) GCD of 35 and 35 is : 35 (Using Recursion) GCD of 35 and 35 is : 35 (Using Iteration)

15. Write a C program to implement an iterative and recursive function to compute the following series by accepting the value of **N** and printing the final computed value by the function in calling program.

$$1^2 - 2^2 + 3^2 - 4^2 + ...N^2$$

Sample Test Data

Input	Output
3	

Enter the value of N: 20	The sum of the series is : - 210 (Using Recursion) The sum of the series is : - 210 (Using Iteration)
Enter the value of N: 25	The sum of the series is : 325 (Using Recursion) The sum of the series is : 325 (Using Iteration)
Enter the value of N: 13	The sum of the series is : 91 (Using Recursion) The sum of the series is : 91 (Using Iteration)

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Sample Program

Question: Write an algorithm and draw a flowchart to find the average of top three test results out of four conducted. Write a C program for the problem by giving the sample test data as input and documenting the output. [Hint: eliminate the smallest one].

Example:

Suppose marks obtained in four tests are: 75 45 69 77

Average of top three test results: [(75+45+69+77) – 45]/3.0 = 221/3.0 = 73.66

Input Format:

Input will contain number of test cases T.

For each test case, input will be four integer numbers (Less than or equals to 100).

Output Format:

Output will be average of top three test results.

Sample Test Data

Input	Output
3	

Enter results of Four Tests 75 72 79 69	The average of best three test results is : 75.33
Enter results of Four Tests 25 70 99 73	The average of best three test results is : 80.67
Enter results of Four Tests 65 33 89 83	The average of best three test results is : 79.00

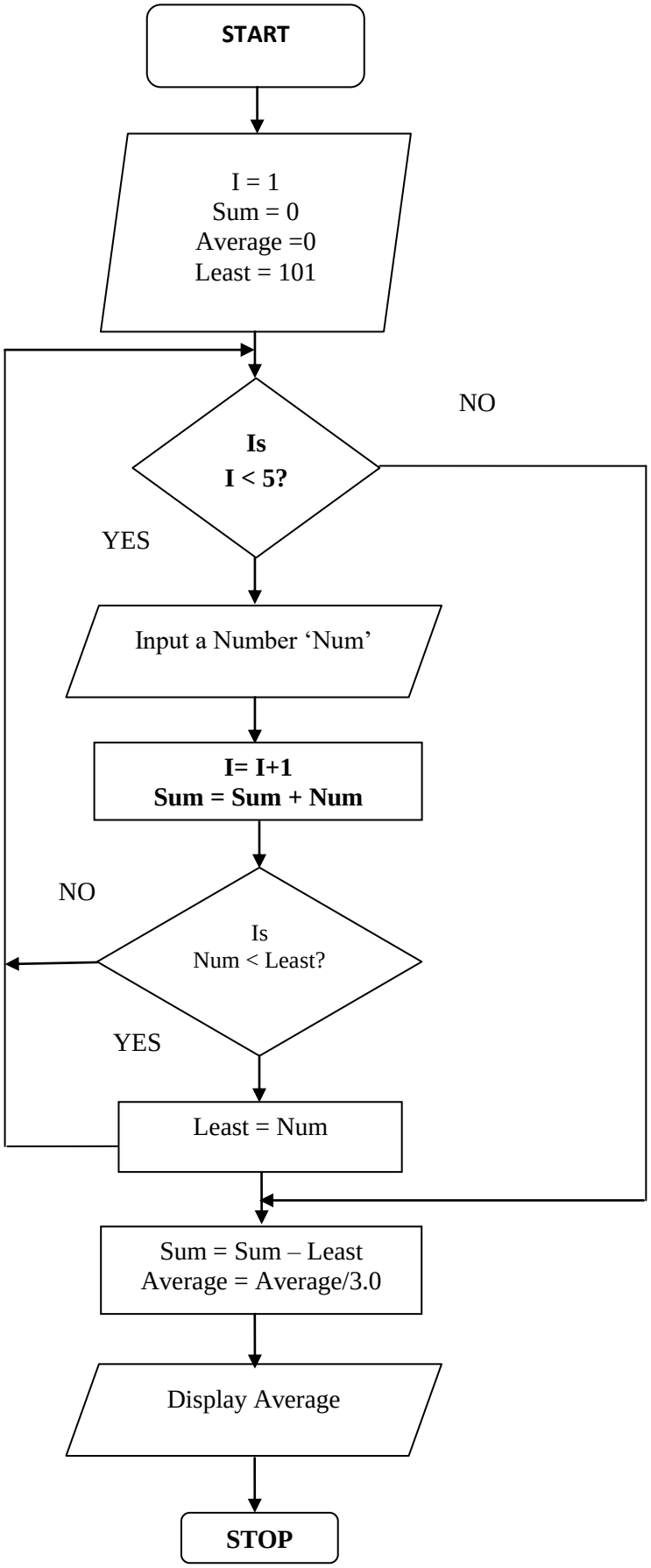
Algorithm

1. START
2. Initialize Sum = 0
3. Initialize Avg = 0.0
4. Initialize Least = 101
5. Initialize I = 1
6. Read a number ‘Num’
7. Sum = Sum + Num
8. If Num < Least
9. Least = Num
10. I = I + 1
11. If I < 5 goto STEP65 else goto STEP 12
12. Sum = Sum – Least
13. Avg = Sum /3.0
14. Print Avg.
15. STOP

C Program

```
#include <stdio.h>
#include <conio.h>
int main()
{
   int sum=0, least=101, i, num;
   float avg=0.0;
   clrscr();  //Inbuilt function to clear the screen
   printf("Enter results of Four Tests \n\n");
   for(i=0;i<4;i++)  // The loop iterates four times to accept the total marks in four subjects
          {
            scanf("%d",&num);
            sum = sum+num;
            if(num<least)          // find the least marks
                  least = num;
          }
   sum=sum - least;     // Subtracts the least from the total sum
   avg=sum/3.0;         // Computes the average of best three marks
   printf("\n\ The average of best three test results is %5.2f \n", avg);
   return 0;
   }
```

Flow Chart


START
I = 1
Sum = 0
Average =0
Least = 101
Is
I < 5?
NO
YES
Input a Number 'Num'
I= I+1
Sum = Sum + Num
NO
Is
Num < Least?
YES
Least = Num
Sum = Sum – Least
Average = Average/3.0
Display Average
STOP