

Assignment 2 - Programming in C

1. Write a C program using function that will calculate and display the real roots of a given quadratic equation $ax^2+bx+c=0$. (Assume that the calculated root will be always real).

Ans:

Program

```
#include<stdio.h>
#include<math.h>
void root(int,int,int);
void main()
{
    int x,y,z;
    printf("Enter coefficients of x2 and x and the constant (a,b,c):");
    scanf("%d,%d,%d",&x,&y,&z);
    root(x,y,z);
}
void root(int a,int b,int c)
{
    int n=(b*b)-(4*a*c);
    if(n<0)
        printf("The roots of the homogenous quadratic equation, \
        %dx2+%dx+%d=0 are not real.",a,b,c);
    else
    {
        int r1=(-b+pow(n,(1/2)))/(2*a);
        int r2=(-b-pow(n,(1/2)))/(2*a);
        printf("The roots of the homogenous quadratic equation, \
        %dx2+%dx+%d=0 are %d and %d.",a,b,c,r1,r2);
    }
}
```

Output

Enter coefficients of x2 and x and the constant (a,b,c):1,5,6

The roots of the homogenous quadratic equation, $1x^2+5x+6=0$ are -2 and -3.

2. Define recursion with an example. Differentiate between iteration and recursion.

Ans:

Recursion is calling a function inside the function using a condition so that once the function is called, it will keep

calling itself, creating a loop, until the condition is met. The effect here is similar to the working of a while loop.

Eg:

```
#include<stdio.h>
void recur(int);
void recur(int m)
{
    int k=0;
    if(m=9)
        printf("%d",k);
    Else
    {
        m++;
        k=k+m;
        recur(m);
    }
}
void main()
{
    int j=1;
    recur(j);
}
```

This is a very simple program using recursion that prints the sum of first 8 natural numbers. Here the function is first called in the main function. After that, the condition checks whether the value of 'm', the parameter used here, is equal to 9. We have given 'j=1' in the main function, which then, in the function becomes 'm'. Since 'm'=1, which is less than 9, the statements in the else condition is executed – m is incremented by 1, m is added to k and then the function is called. This will continue to repeat until 'm' reaches 9 in value, meeting the condition, and then k is printed. The final value of k will be (1+2+3+4+5+6+7+8). This is how recursion works.

An iteration refers to the execution of a loop for 1 time. The number of iterations of a loop can be set initially or inside the loop.

Recursion is calling a function inside the function using a condition so that once the function is called, it will keep calling itself, creating a loop, until the condition a loop, until the condition is met. The effect here is similar to the working of a while loop. However, unlike while loop, we cannot control the number or times a recursion will occur using the initial declaring statement. I can only be done inside the recursive function itself using a condition.

3. Write a C program to find the GCD of two numbers using recursive function.

Ans :

Program

```

#include<stdio.h>
void recur(int,int,int);
void main()
{
    int a,b,c,i;
    printf("Enter two numbers to get GCD (a,b): ");
    scanf("%d,%d",&a,&b);
    if(a>b)
        c=a/2;
    else
        c=b/2;
    recur(a,b,c);
}
void recur(int a,int b,int c)
{
    if(a%c==0)
        if(b%c==0)
            printf("The GCD of %d and %d is %d.",a,b,c);
        else
        {
            c=c-1;
            recur(a,b,c);
        }
    Else
    {
        c=c-1;
        recur(a,b,c);
    }
}

```

Output

Enter two numbers to get GCD (a,b): 1500,4500
The GCD of 1500 and 4500 is 1500.

4. Write a program to read the mark details of a student and find total and percentage using array in structure.

Ans:

Program

```

#include<stdio.h>
#include<string.h>
struct file
{
    char name[40];
    int r,M[5],tm;
    float tp;
}std;
void main()

```

```

{
    int t,i;
    printf("Enter total marks for 1 subject : ");
    scanf("%d",&t);
    printf("Enter student name : ");
    scanf("%s",std.name);
    printf("Enter roll no : ");
    scanf("%d",&std.r);
    for(i=0;i<5;i++)
    {
        printf("Enter student mark %d : ",i+1);
        scanf("%d",&std.M[i]);
    }
    std.tm=std.M[0]+std.M[1]+std.M[2]+std.M[3]+std.M[4];
    std.tp=(float)std.tm*100/(t*5);
    printf("\nName: %s\nRoll no: %d\nMarks \: %d,%d,%d,%d,%d\nTotal Marks : %d\nPercentage \: %f\n",std.name,std.r,std.M[0],std.M[1],std.M[2],std.M[3],std.M[4],std.tm,std.tp);
}

```

Output

```

Enter total marks for 1 subject : 100
Enter student name : Kutty
Enter roll no : 40
Enter student mark 1 : 11
Enter student mark 2 : 100
Enter student mark 3 : 87
Enter student mark 4 : 99
Enter student mark 5 : 98
Name
: Jerin
Roll no
: 40
Marks
: 11,100,87,99,98
Total Marks : 395
Percentage : 79.000000

```

5. Write a program to create a structure employee with member variables name, age, be, da, hra and tsalary. Total Salary is calculated by the equation $tsalary = (1+da+hra)*bs$. Read the values of an employee and display it.

Ans:

Program

```

#include<stdio.h>
#include<string.h>
struct employee
{

```

```

        char name[40];
        int age,bs;
        float da,hra,tsalary;
    }emp;
    void main()
    {
        int i;
        printf("Enter employee name
        : ");
        scanf("%s",emp.name);
        printf("Enter age
        : ");
        scanf("%d",&emp.age);
        printf("Enter Basic Salary (BS)
        : ");
        scanf("%d",&emp.bs);
        printf("Enter Dearness Allowance (DA)(Percentage) : ");
        scanf("%f",&emp.da);
        printf("Enter House Rent Allowance (HRA)(Percentage) : ");
        scanf("%f",&emp.hra);
        emp.tsalary=(1+emp.da/100+emp.hra/100)*emp.bs;
        printf("\nName: %s\nAge: %d\nBasic salary (BS): %d\nDearness Allowance (DA) :
        %f%%\nHouse Rent Allowance (HRA) : %f%%\nTotal
        \Salary:%f\n",emp.name,emp.age,emp.bs,emp.da,emp.hra,emp.tsalary);
    }

```

Output

```

Enter employee name: Jerin
Enter age: 19
Enter Basic Salary (BS): 100000
Enter Dearness Allowance (DA)(Percentage): 23
Enter House Rent Allowance (HRA)(Percentage) : 51
Name: Jerin
Age: 19
Basic salary (BS): 100000
Dearness Allowance (DA): 23.000000%
House Rent Allowance (HRA) : 51.000000%
Total Salary: 174000.000000

```

6. Write a function namely myFact in C to find the factorial of a given number. Also, write another function in C namely nCr which accepts two positive integer parameters na and r and returns the value of the mathematical function $C(n,r) = \frac{n!}{r!(n-r)!}$. The function nCr is expected to make use of the factorial function myFact.

Ans:

Program

```

#include<stdio.h>
int myFact(int);

```

```

float nCr(int,int);
void main()
{
    int n,r;
    float c;
    printf("Number of possible outcomes (n): ");
    scanf("%d",&n);
    printf("Number of favourable outcomes (r) : ");
    scanf("%d",&r);
    c=nCr(n,r);
    printf("The possible number of combinations : %f",c);
}
int myFact(int a)
{
    int f=1;
    while(a>0)
    {
        f=f*a;
        a=a-1;
    }
    return f;
}
float nCr(int n,int r)
{
    int p=0;
    p=(myFact(n)/(myFact(r)*myFact(n - r)));
    return p;
}

```

Output

Number of possible outcomes (n):9

Number of favourable outcomes (r) : 6

The possible number of combinations : 84.000000