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SECTION: BA1

CSO 101 LAB ASSIGNMENT-6: FUNCTIONS

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SOLUTIONS

1) Write a C program that calls a function to print the nth term of the Fibonacci series (1, 1, 2, 3, 5, 8, 13, …). User will input n through keyboard. For example, if n=5, output is 5.

CODE:

```c
#include <stdio.h>
int fib(int n)
{
    int val;
    int a = 0;
    int b = 1;
    if (n == 1)
        val = 1;
    else
    {
        for (int i = 1; i < n; i++)
        {
            int c = a + b;
            a = b;
            b = c;
        }
        val = b;
    }
    return val;
}
int main()
{
    int n;
    printf("Enter a number: ");
    scanf("%d", &n);
    fflush(stdin);
    int val = fib(n);
    printf("The %dth term of Fibonacci series is %d.\n", n, val);
    return 0;
}
```

```
PS C:\Users\91933\Documents\CSO\Assignments\Lab assignments\S6> cd "c:\Users\91933\Documents\CSO\Assignments\Lab assignments\S6\" ; if ($?) { gcc q1.c -o q1 } ; if ($?) {
.\q1 }
Enter a number: 5
The 5th term of Fibonacci series is 5.
PS C:\Users\91933\Documents\CSO\Assignments\Lab assignments\S6> cd "c:\Users\91933\Documents\CSO\Assignments\Lab assignments\S6\" ; if ($?) { gcc q1.c -o q1 } ; if ($?) {
.\q1 }
Enter a number: 10
The 10th term of Fibonacci series is 55.
PS C:\Users\91933\Documents\CSO\Assignments\Lab assignments\S6>
```

2. Write a C program, that calls a function to swap the values of two memory locations. Use Call by Reference.

CODE:

```c
#include <stdio.h>
void swap(int *, int *);
int main()
{
    int a, b;
    printf("Enter a and b: ");
    scanf("%d %d", &a, &b);
    fflush(stdin);
    swap(&a, &b);
    printf("a = %d and b = %d", a, b);
    return 0;
}
void swap(int *x, int *y)
{
    int temp;
    temp = *x;
    *x = *y;
    *y = temp;
}
```

OUTPUT:

```
PS C:\Users\91933\Documents\CSO\Assignments\Lab assignments\S6> cd "c:\Users\91933\Documents\CSO\Assignments\Lab assignments\S6\" ; if ($?) { gcc q2.c -o q2 } ; if ($?) {
.\q2 }
Enter a and b: 55 58
a = 58 and b = 55
PS C:\Users\91933\Documents\CSO\Assignments\Lab assignments\S6>
```

3. Write a C function to evaluate a polynomial given its order n and coefficients $a_1,\ldots,a_n$ a point x.

CODE:

```c
#include <stdio.h>
int eval(int n, int x, int arr[n+1]);
int main()
{
    int n, x;
    printf("Enter order n: ");
    scanf("%d", &n);
    fflush(stdin);
    printf("Enter point x: ");
    scanf("%d", &x);
    fflush(stdin);
    int arr[n+1];
    for (int j = 0; j < (n+1); j++)
    {
        printf("Enter a%d:", j);
        scanf("%d", &arr[j]);
        fflush(stdin);
    }
    int c=n+1;
    int c1=n;
    for (int i=n;i>-1;i--)
    {
        printf("%d x^%d ",arr[i],c1);
        c=c-1;
        c1=c1-1;
        if (c>0)
        printf("+ ");
        if (c==0)
        printf("= 0\n");
    }
    eval(n, x, arr);
    return 0;
}
int eval(int n, int x, int arr[n+1])
{
    int sum = 0;
    for (int i = 0; i < (n+1); i++)
    {
        int t=1;
        for (int j=0;j<(i);j++)
        t=t*x;
        sum=sum+arr[i]*t;
    }
}
```

```
        printf("The value of the polynomial at %d is %d.\n", x,sum);
        return 0;
}
```

OUTPUT:

```
Enter order n: 2
Enter point x: 5
Enter a0:6
Enter a1:5
Enter a2:3
3 x^2 + 5 x^1 + 6 x^0 = 0
The value of the polynomial at 5 is 106.
PS C:\Users\91933\Documents\CSO\Assignments\Lab assignments\S6> █
```

4. Write a C function that can be called to find the largest element of an m by n matrix.

CODE:

```c
#include <stdio.h>
int max(int m, int n, int arr[m][n]);
int main()
{
    int m, n,val=0;
    printf("Enter row m and column n for the matrix 1: \n");
    scanf("%d %d", &m, &n);
    fflush(stdin);
    int arr[m][n];
    printf("Enter the matrix: \n");
    for (int i = 0; i < m; i++)
    {
        for (int j = 0; j < n; j++)
        {
            printf("Enter value for mat[%d][%d]:", i, j);
            scanf("%d", &arr[i][j]);
            fflush(stdin);
        }
    }
    printf("The matrix is: \n");
    for (int i = 0; i < m; i++)
    {
        for (int j = 0; j < n; j++)
        {
            printf("%d ", arr[i][j]);
        }
        printf("\n");
```

```c
    }
    max(m,n,arr);
    return 0;
}
int max(int m, int n, int arr[m][n])
{
    int max1 = 0;
    for (int i = 0; i < m; i++)
    {
        for (int j = 0; j < n; j++)
        {
            if (arr[i][j] > max1)
            max1 = arr[i][j];
        }
        printf("\n");
    }
    printf("The maximum element is %d.\n",max1);
    return 0;
}
```

OUTPUT:

```
Enter row m and column n for the matrix 1:
2 3
Enter the matrix:
Enter value for mat[0][0]:23
Enter value for mat[0][1]:12
Enter value for mat[0][2]:1
Enter value for mat[1][0]:2
Enter value for mat[1][1]:34
Enter value for mat[1][2]:234
The matrix is:
23 12 1
2 34 234

The maximum element is 234.
PS C:\Users\91933\Documents\CSO\Assignments\Lab assignments\S6>
```

5. Write a C program that takes as input three distinct integers, and calls a function to find the maximum of the three numbers.

CODE:

```c
#include<stdio.h>
int max(int a, int b, int c)
{
    int m=a;
    if (b>m)
    {
        if (c>b)
        m=c;
        else
        m=b;
    }
    else if (c>m)
    {
        if (b>c)
        m=b;
        else
        m=c;
    }
    return m;
}
int main()
{
    printf("Enter a, b, c: \n");
    int a,b,c;
    scanf("%d %d %d",&a,&b,&c);
    int val=max(a,b,c);
    printf("The maximum value is %d.\n",val);
}
```

OUTPUT:

```
Enter a, b, c:
23 45 1
The maximum value is 45.
PS C:\Users\91933\Documents\CSO\Assignments\Lab assignments\S6>
```

6. Study how to call main() with arguments. Write a C program to input two integer numbers at run-time and next compute the sum of the two numbers.

STUDY:

The function main() marks the point where the program should start being executed. We can call the main() function with arguments. The first parameter, argc (argument count) is an integer which indicates the number of arguments entered on the command line during the beginning of execution. The second parameter, argv[] (argument vector), is an array of pointers to arrays of character objects. The array objects are null-terminated strings, which represent the arguments that were entered on the command line when the program began to execute. argv[0] is a pointer to the character array that contains the program name, argv[1] indicates the first argument passed to the program, argv[2] the second argument, and so on. In the following code to compute the sum of two numbers, atoi() is a library function that converts a string value to integer, when program gets the input from command line.

CODE:

```c
#include <stdio.h>
#include<stdlib.h>
int main(int argc, char *argv[])
{
    int a,b,sum;
    if(argc!=3)
    {
        printf("Two values needed.\n");
        return -1;
    }
    a = atoi(argv[1]);
    b = atoi(argv[2]);
    sum = a+b;
    printf("Sum of %d and %d is: %d\n",a,b,sum);
    return 0;
}
```

OUTPUT:

```
PS C:\Users\91933\Documents\CSO\Assignments\Lab assignments\S6> gcc q6ren.c
PS C:\Users\91933\Documents\CSO\Assignments\Lab assignments\S6> .\a.exe 20 34
Sum of 20 and 34 is: 54
PS C:\Users\91933\Documents\CSO\Assignments\Lab assignments\S6> gcc q6ren.c
PS C:\Users\91933\Documents\CSO\Assignments\Lab assignments\S6> .\a.exe 20
Two values needed.
PS C:\Users\91933\Documents\CSO\Assignments\Lab assignments\S6>
```

7. Create a user-defined library "user.h" and define the following two functions in the library:

(a) int fact(int): takes an integer as input and returns the factorial of the input integer,

(b) void fib(int): takes as input an integer (say, n) and prints the nth term of the Fibonacci series.

CODE FOR USER-DEFINED LIBRARY "user.h":

```c
int fact()
{
    // calculating factorial of a number input
    int n;
    printf("Enter an integer to find its factorial: ");
    scanf("%d", &n);
    fflush(stdin);
    int val = 1;
    for (int i = 1; i < (n + 1); i++)
        val = val * i;
    return val;
}
void fib()
{
    // calculating the nth term of Fibonacci series
    int n, valf;
    printf("Enter n to find nth term of Fibonacci series: ");
    scanf("%d", &n);
    fflush(stdin);
    int val;
    int a = 0;
    int b = 1;
    if (n == 1)
        val = 1;
    else
    {
        for (int i = 1; i < n; i++)
        {
            int c = a + b;
            a = b;
```

```
            b = c;
        }
        val = b;
    }
    printf("The %dth value of the Fibonacci series is:
%d.\n", n, val);
}
```

USING "user.h" IN A CODE:

```c
#include<stdio.h>
#include"user.h"
int main()
{
    printf("The factorial is %d.\n",fact());
    fib();
    return 0;
}
```

OUTPUT:

```
Enter an integer to find its factorial: 5
The factorial is 120.
Enter n to find nth term of Fibonacci series: 10
The 10th value of the Fibonacci series is: 55.
PS C:\Users\91933\Documents\CSO\Assignments\Lab assignments\S6> 
```