Programming Fundamentals

Lab Report

Lab 05

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Class	Programming Fundamentals CSC103 (**BCE-2B**)
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In Lab Tasks

Question no: 1

Write a C function 'int **test prime(**int**);'** that takes in a positive number as input and returns *true* (1) if the input number is prime or *false* (0) if the input is not prime. Then using this function, write a C program that takes a number (N) as input from the user and prints out the first N prime numbers

Solution:

In this Program, I made a function named test prime, in that function I used a for loop with if and else statement, the code is attached below,

```c
#include <stdio.h>
#include <stdlib.h>

int test_prime(int n)
{

int i;
int ctt=0;
int p=0;


    for (i = 1; i <= n; i++)
    {
        if (n % i == 0)
        {
            ctt++;
        }

    }
        if (ctt == 2)
        {
         printf("1");
          ctt=ctt+1;
        }
        else
        {
            printf("0");
        }
}
```

```c
    {
        if (n % i == 0)
        {
            ctt++;
        }

    }
        if (ctt == 2)
        {
         printf("1");
          ctt=ctt+1;
        }
        else
        {
            printf("0");
        }
}



int main()
{
    int N;
    printf("Enter any positive number to check if it is Prime or not\n");
    scanf("%d",&N);
    test_prime(N);

}
```

```
46              break;
47              }
48
49              case 4:
50              {
51          printf("Enter the First Digit?");
52          scanf("%f",&num1);
53          printf("Enter the Second Digit?");
54          scanf("%f",&num2);
55          total= num1 - num2;
56          printf("The Value of %f Minus %f is : %f ",num1,num2,total);
57          break;
58              }
59
60              default:
61              {
62                  printf("Select the above options only!!");
63              }
64
65          }
66
67
68
69
70
71          return 0;
72      }
```

The result for this code is attached below,

When we enter 1, the output is 0, which shows that it is not prime.

When we enter 2, the output is 1, which shows that the number is prime.

Now, for the program that prints n prime numbers, the code is attached below,
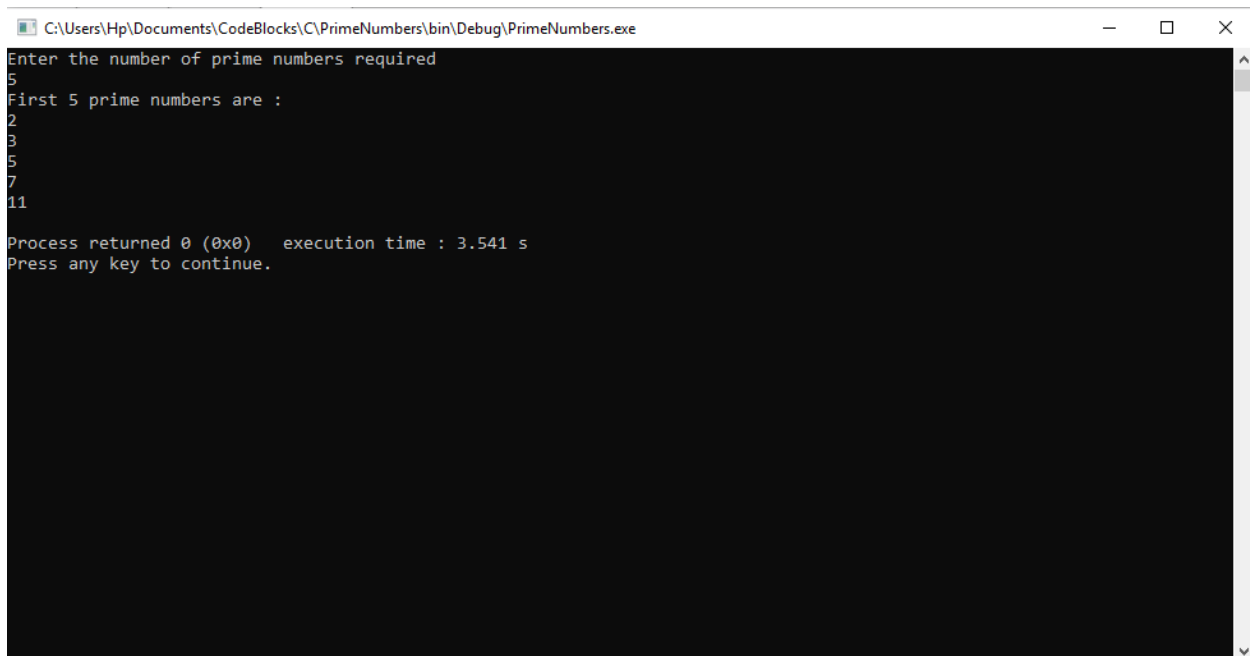
```c
int n, i = 3, count, c;

printf("Enter the number of prime numbers required\n");
scanf("%d",&n);

if ( n >= 1 )
{
    printf("First %d prime numbers are :\n",n);
    printf("2\n");
}

for ( count = 2 ; count <= n ;  )
{
    for ( c = 2 ; c <= i - 1 ; c++ )
    {
        if ( i%c == 0 )
            break;
    }
    if ( c == i )
    {
        printf("%d\n", i);
        count++;
    }
    i++;
}
```

We enter 5 and it prints first 5 prime numbers.

```
C:\Users\Hp\Documents\CodeBlocks\C\PrimeNumbers\bin\Debug\PrimeNumbers.exe       —   □   ✕

Enter the number of prime numbers required
5
First 5 prime numbers are :
2
3
5
7
11

Process returned 0 (0x0)    execution time : 3.541 s
Press any key to continue.
```

Hence, these results further verify the that our program works for all values and is correct.

Question no: 2(a)

(a) Write a C program that asks user to input a value for θ in degrees .It should then calculate the value of the mathematical function y and print its value on screen. Write separate functions to implement $f_1(\theta)$ *and* $f_2(\theta)$.

$$y = f_1(\theta) + f_2(\theta)$$

$$f_1(\theta) = \left(\cos\frac{\theta}{2}\right)^2$$

$$f_2(\theta) = -\left(\sin\frac{\theta}{2}\right)^2$$

Solution

The code for the following program is attached below, I used made two funtions in this program, f1 and f2

```c
#include <stdio.h>
#include <stdlib.h>
#include <math.h>


float f1(float theta)
{
    theta = cos(theta/2) * cos(theta/2);

    return theta;
}


float f2(float theta)
{
    theta = -1 *((sin(theta/2)) * (sin(theta/2)));

    return theta;
}

int main()
{
    float theta;
    float rad;
    float p;
    float q;
    float y;

    printf("Enter theta in degrees\n");
    scanf("%f",&theta);

    rad = (theta * 3.14159)/180; /// converting degrees into radians

    p = f1(rad);
```

```
float f2(float theta)
{
    theta = -1 *((sin(theta/2)) * (sin(theta/2)));

    return theta;
}

int main()
{
    float theta;
    float rad;
    float p;
    float q;
    float y;

    printf("Enter theta in degrees\n");
    scanf("%f",&theta);

    rad = (theta * 3.14159)/180; /// converting degrees into radians

    p = f1(rad);

    q = f2(rad);

    y = p + q;

    printf("The value of y is %f\n",y);

    return 0;
}
```

I tested the program for Theta= 90, the result for Y
result is shown below,

C:\Users\Hp\Documents\CodeBlocks\C\Lab05Question2\bin\Debug\Lab05Question2.exe   —   □   ×

```
Enter theta in degrees
90
The value of y is 0.000001

Process returned 0 (0x0)    execution time : 1.465 s
Press any key to continue.
```

Hence it is correct.

Question no: 2(b)

(a) Modify the above program to calculate the value of y.

$$y = f_1(\theta) + f_2(\theta) + f_3(\theta)$$

$$f_1(\theta) = \left(\cos\frac{\theta}{2}\right)^2$$

$$f_2(\theta) = 0.5\sqrt{\frac{1 + \cos 2\theta}{2}}$$

$$f_3(\theta) = \frac{1}{2}$$

Solution

In this Program I used functions just like the previous part, the code and results are attached below.

```
#include <stdio.h>
#include <stdlib.h>
#include <math.h>

float f1(float theta)
{
    theta = cos(theta/2) * cos(theta/2);

    return theta;
}

float f2(float theta)
{
    theta = 0.5 * sqrt((1 + cos(2*(theta)))/2);

    return theta;
}

float f3(float theta)
{
    theta = 0.5;

    return theta;
}

int main()
```

```
22        └ }
23
24        float f3(float theta)
25        ⊟{
26              theta = 0.5;
27
28              return theta;
29        └ }
30
31
32        int main()
33        ⊟{
34              float theta;
35              float p;
36              float q;
37              float r;
38              float y;
39
40              printf("Enter the value of theta\n");
41              scanf("%f",&theta);
42
43              p = f1(theta);
44              q = f2(theta);
45              r = f3(theta);
46
47              y = p + q + r;
48
49              printf("The value of y is %f\n",y);
50
51        }
52
```

The result for user input 90 is shown below,

```
Enter the value of theta
90
The value of y is 1.000000

Process returned 0 (0x0)    execution time : 3.356 s
Press any key to continue.
```

Hence this verifies that our program is correct.

POST LAB

Question:

Write a C program that takes two floating type inputs from the user and calculates their average, individual factorials, and a function $f(x, y) = \sqrt{x^2 + y^2}$. Use separate C functions to compute the average, factorial and the function 'f'. The program should print the results in the **main** function.

Solution:

In this program I used separate functions for Average, factorial and function 'F',
The code and its working is attached below,

```
1   #include <stdio.h>
2   #include <stdlib.h>
3
4
5   float fact (float x, float y)
6   {
7       float N;
8       N=x;
9       int R=0;
10      int X=0;
11      X=N-1;
12      R=N;
13      do
14      {
15          R=R*X;
16          X=X-1;
17      }
18
19      while(X>=1) ; //Repeat above steps from multiplication to till x greater then equal to 1
20
21          return R;
22
23
24  }
25  float fact1(float x,float y)
26  {
27      float N;
28      N=y;
29      int R=0;
30      int X=0;
31      X=N-1;
32      R=N;
```

```c
39              while(X>=1) ; //Repeat above steps from multiplication to till x greater then equal to 1
40
41                  return R;
42
43      }
44
45      float distanceF(float x,float y)
46
47      {
48          float dist,fdist;
49
50
51      dist=((x)*(x))+((y)*(y));
52
53      fdist=pow(dist,0.5);
54
55      return fdist;
56
57      }
58
59      float average (float x,float y)
60
61      {
62      float a;
63      a= (x+y)/2;
64      return a;
65
66      }
67
68
69      int main()
70      {
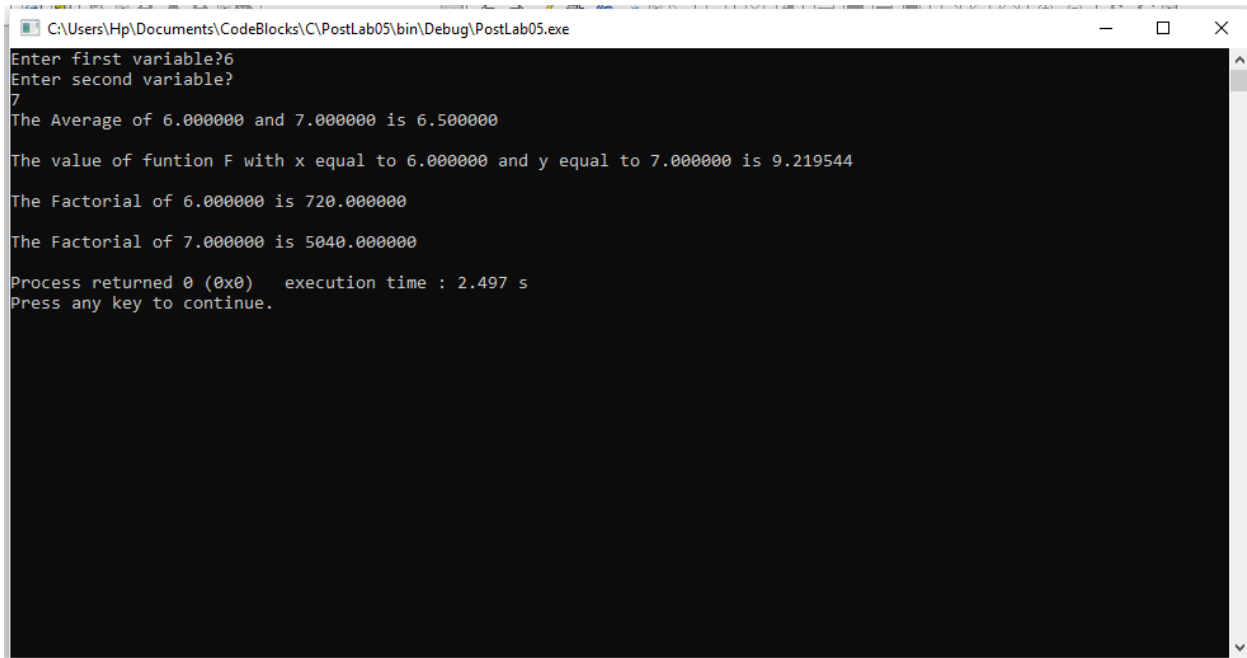```

```c
58
59      float average (float x,float y)
60
61      {
62      float a;
63      a= (x+y)/2;
64      return a;
65
66      }
67
68
69      int main()
70      {
71          float x,y;
72           float a,b,c;
73           float d;
74          printf("Enter first variable?");
75           scanf("%f",&x);
76          printf("Enter second variable?\n");
77           scanf("%f",&y);
78
79      a=average(x,y);
80      b=distanceF(x,y);
81      c=fact(x,y);
82      d=factl(x,y);
83          printf("The Average of %f and %f is %f\n\n", x,y,a);
84          printf("The value of funtion F with x equal to %f and y equal to %f is %f\n\n",x,y,b);
85          printf("The Factorial of %f is %f\n\n",x,c);
86          printf("The Factorial of %f is %f\n ",y,d);
87      }
88
```

I entered two numbers 6 and 7, their result is shown below,

```
C:\Users\Hp\Documents\CodeBlocks\C\PostLab05\bin\Debug\PostLab05.exe                    —    □    ×

Enter first variable?6
Enter second variable?
7
The Average of 6.000000 and 7.000000 is 6.500000

The value of funtion F with x equal to 6.000000 and y equal to 7.000000 is 9.219544

The Factorial of 6.000000 is 720.000000

The Factorial of 7.000000 is 5040.000000

Process returned 0 (0x0)    execution time : 2.497 s
Press any key to continue.
```

Hence, This further verifies that our program is correct and working.

THE END