

Programming Fundamentals

Lab Report

Lab02

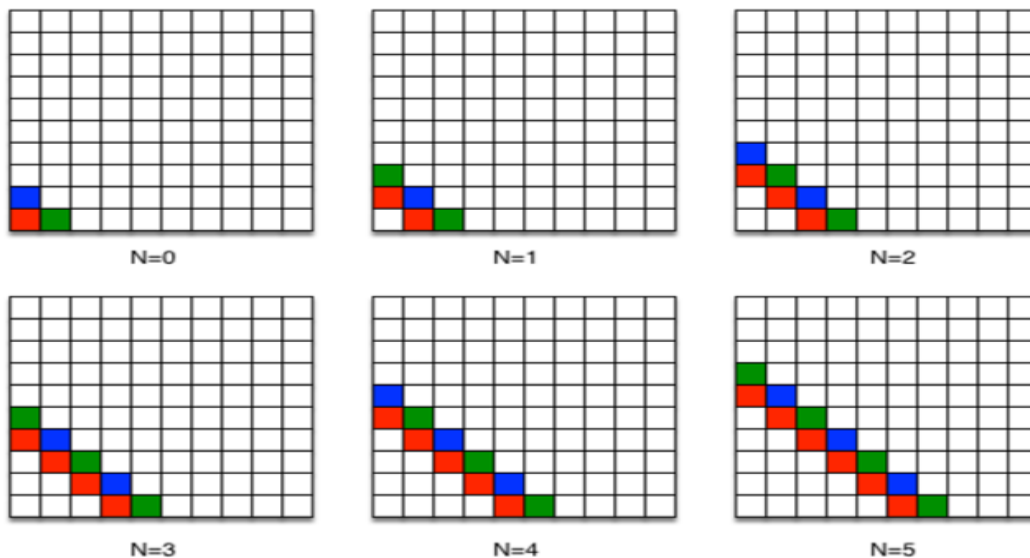


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Class	Programming Fundamentals CSC103 (BCE-2B)
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In Lab Tasks

Question no: 1

Following figure shows a pattern of squares generated for different input values of N (for N=0 to N=5). Develop a general algorithm to fill in the grid for any input N. Use the 4 step process that was discussed in the class (and is given below for reference)



Write an Algorithm for the following?

Solution:

Algorithm for any N:

Step 1: Let N be any number.

Step 2: Take two variables X and Y

Step 3: Let $x=0$.

Step 4: Let $y=x$.

Step 5: If $(X+Y)$ is equal to N, then put a RED Square in (X, Y)

Step 6: Or If $(X+Y)$ is equal to $N+1$ and Y is not a multiple of 2 (i.e $Y\%2 \neq 0$), then put a BLUE Square at (X,Y)

Step 7: Or If $(X+Y)$ is equal to $N+1$ and Y is a multiple of 2 (i.e $Y\%2 == 0$), then put a GREEN Square at (X, Y)

Step 8: Otherwise don't put any color in (X, Y)

Step 9: if Y is less than $N+1$, then add 1 in Y

Step 10: Otherwise add 1 in X and Update the value of Y to 0

Step 11: Repeat from Step 5 till X is equal to $N+1$.

Step 12: Terminate after X is equal to $N+1$ and $Y=0$

Testing our Algorithm:

Now we will test the above Algorithm for $N=2$ and verify our algorithm.

- Given $N=2$
- $X=0$,
- $Y=0$, as $Y=X$

Now

1) $(0+0)$ is not equal to N

$(0+0)$ is not equal to $N+1$

Hence no condition is fulfilled, so we will not put any color in $(0,0)$

Now as Y is less than $N+1$ ($0 < 2$)

We will update $Y=0+1$

$Y=1$

2) Now $X=0$ and $Y=1$

$(0+1)$ is not equal to N

$(0+1)$ is not equal to $N+1$

Hence no condition is fulfilled, so we will not put any color in (0,1)

Now as Y is less than N+1 ($0 < 2$)

We will update $Y=1+1$

$Y=2$

3) Now $X=0$ and $Y=2$

$(0+2)$ is equal to N, hence the condition is fulfilled so we will Put Red Color in (0,2)

Now as Y is less than N+1 ($0 < 2$)

We will update $Y=2+1$

$Y=3$

4) Now $X=0$ and $Y=3$

$(0+3)$ is equal to N+1 and Y is not a multiple of 2,

Hence the condition is fulfilled, so we will put any BLUE color in (0,3)

Now as Y is not less than N+1 ($3 < 2$)

Then we will Add 1 in X and Update $Y=0$

$X=1$

$Y=0$

5) Now $X=1$ and $Y=0$

$(1+0)$ is not equal to N

$(1+0)$ is not equal to N+1

Hence no condition is fulfilled, so we will not put any color in (1,0)

Now as Y is less than N+1 ($0 < 2$)

We will update $Y=0+1$

$Y=1$

6) Now $X=1$ and $Y=1$

$(1+1)$ is equal to N

Hence the condition is fulfilled, so we will put Red Color at $(1,1)$

Now as Y is less than $N+1$ ($1 < 2$)

We will update $Y=1+1$

$Y=2$

7)

Now $X=1$ and $Y=2$

$(1+2)$ is equal to $N+1$ and Y is a Multiple of 2,

Hence the condition is fulfilled, so we will not put Green color at $(1,2)$

Now as Y is not less than $N+1$ ($2 < 2$)

We will add 1 in X and update $Y=0$

$X=2$

$Y=0$

8)

Now $X=2$ and $Y=0$

$(2+0)$ is not equal to N

Hence the condition is fulfilled, so we will put Red any color in $(2,0)$

Now as Y is less than $N+1$ ($0 < 2$)

We will update $Y=0+1$

$Y=1$

9)

Now $X=2$ and $Y=1$

$(2+1)$ is not equal to $N+1$ and Y is not a multiple of 2

Hence the condition is fulfilled, so we will put Blue any color in (2,1)

Now as Y is less than N+1 ($1 < 2$)

We will update $Y=1+1$

$Y=2$

10)

Now $X=2$ and $Y=2$

$(2+2)$ is not equal to N

$(2+2)$ is not equal to N+1

Hence no condition is fulfilled, so we will not put any color in (2,2)

Now as Y is not less than N+1 ($2 < 2$)

We will update $X=2+1$ and $Y=0$

$X=3$

11)

Now $X=3$ and $Y=0$

$(3+0)$ is equal to N+1

Hence the condition is fulfilled, so we will put Blue any color in (3,0)

Now as $X= N+1$ and $Y=0$, the Program will terminate.

We got the same pattern as the above pattern; hence our Algorithm is verified as correct, I have also checked the above algorithm for $N=6$ and it works fine.

QUESTION NO:2

Write a C program for following piecewise function. Program must take input from user and calculate and print the function result on screen.

$$f[n] = \begin{cases} -n - 4, & n < 3 \\ n^2 - 7, & 3 \leq n \leq 10 \\ \frac{120}{n} + n, & n > 10 \end{cases}$$

where n is an integer variable

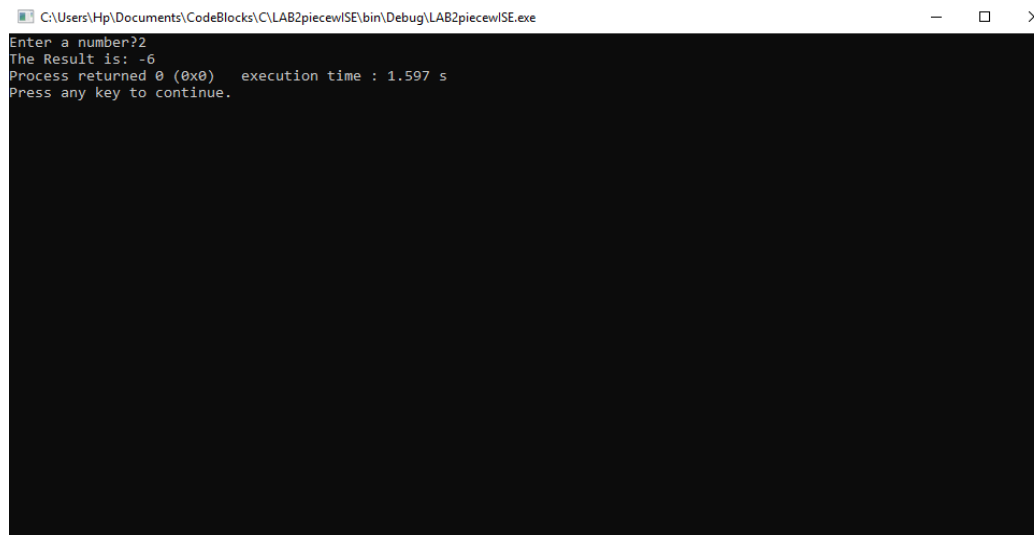
Solution:

I am attaching my code below, for this program, I used If/else Statements in my code, I took input n from the user and if (n<3) a certain function was performed, if n was greater then equal to 3 and less then equal to 10 then another function was performed, for value of n greater then 10 a specific function was performed.

```
1  #include <stdio.h>
2  #include <stdlib.h>
3
4  int main()
5  {
6      int n,a;
7      printf("Enter a number?");
8      scanf("%d",&n);
9
10     if(n<3)
11     {
12
13         a=(-n-4);
14         printf("The Result is: %d",a);
15     }
16
17     else if(n>=3 && n<=10)
18     {
19
20         a=((n*n)-7);
21         printf("The Result is: %d",a);
22     }
23
24     else
25     {
26
27         a=((120/n)+n);
28         printf("The Result is: %d",a);
29     }
30     return 0;
31 }
32
```

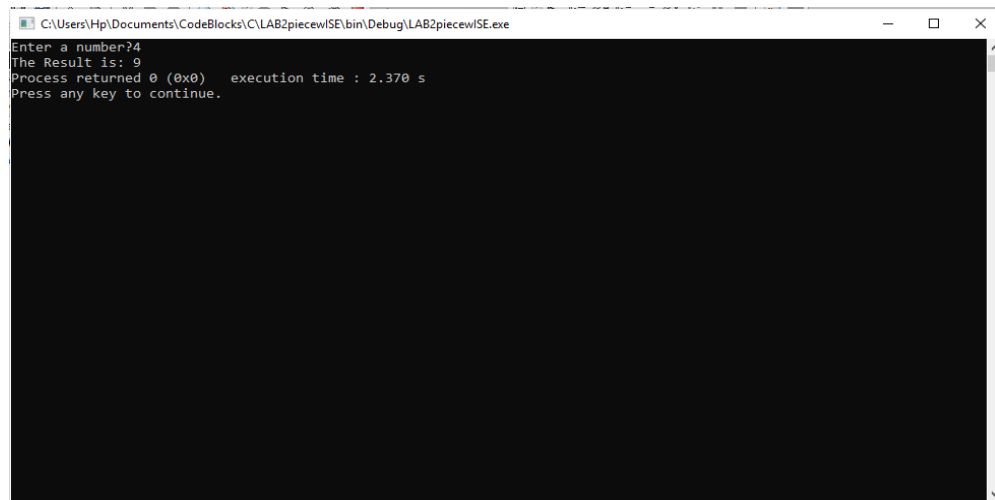
3 tested values from Each function is Attached below:

For n=2



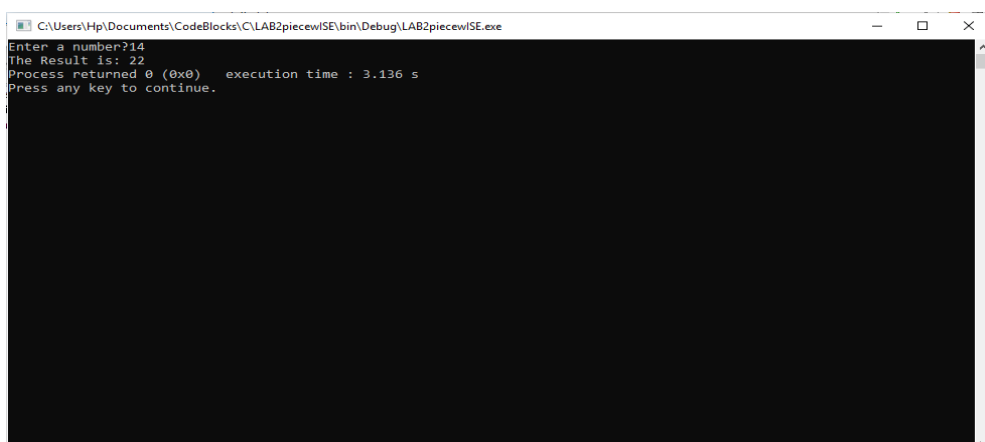
A screenshot of a Windows command prompt window. The title bar shows the file path: C:\Users\Hp\Documents\CodeBlocks\C\LAB2piecwise\bin\Debug\LAB2piecwise.exe. The window contains the following text: "Enter a number?2", "The Result is: -6", "Process returned 0 (0x0) execution time : 1.597 s", and "Press any key to continue.". The rest of the window is black.

For n=4



A screenshot of a Windows command prompt window. The title bar shows the file path: C:\Users\Hp\Documents\CodeBlocks\C\LAB2piecwise\bin\Debug\LAB2piecwise.exe. The window contains the following text: "Enter a number?4", "The Result is: 9", "Process returned 0 (0x0) execution time : 2.370 s", and "Press any key to continue.". The rest of the window is black.

For n=14



A screenshot of a Windows command prompt window. The title bar shows the file path: C:\Users\Hp\Documents\CodeBlocks\C\LAB2piecwise\bin\Debug\LAB2piecwise.exe. The window contains the following text: "Enter a number?14", "The Result is: 22", "Process returned 0 (0x0) execution time : 3.136 s", and "Press any key to continue.". The rest of the window is black.

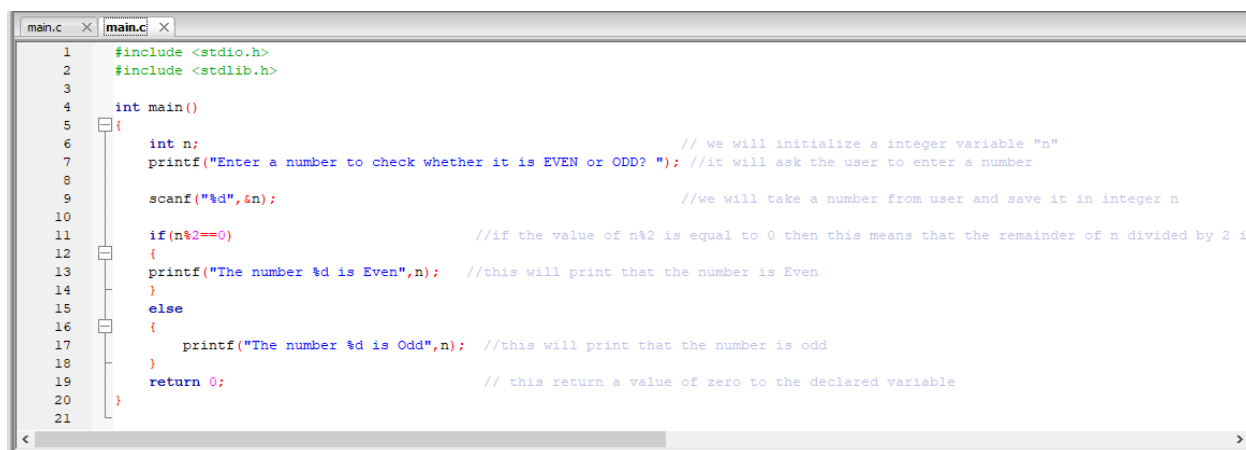
POST LAB

Question:

Write a program that takes integer input from user and tells (displays on the output console screen) whether it is even or odd.

Solution:

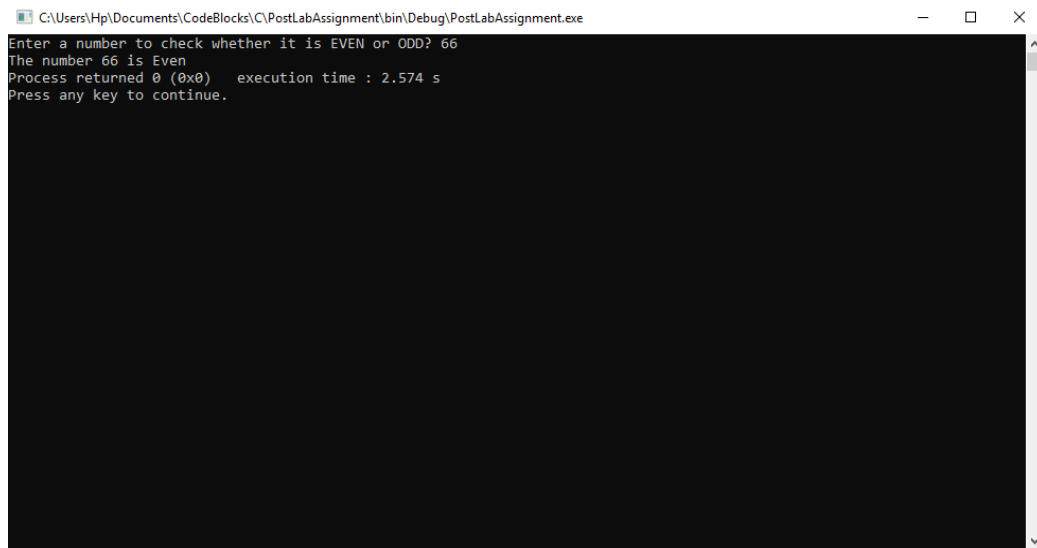
I am attaching my code below for this program as well, I used if/else statement with MOD operator in this program, my program takes a certain value as input from the user and then checks if the value is a multiple of 2, if it is a multiple of 2 then Even is printed on the console else it prints that the number is Odd, for this I used MOD operator which check if N divided by two has a remainder of 0 or not ($N\%2==0$) if N divided by zero gives 0 as remainder then the Integer N is said to be Even otherwise Odd.

A screenshot of a code editor window showing a C program. The window has two tabs, both labeled 'main.c'. The code is as follows:

```
1  #include <stdio.h>
2  #include <stdlib.h>
3
4  int main()
5  {
6      int n; // we will initialize a integer variable "n"
7      printf("Enter a number to check whether it is EVEN or ODD? "); //it will ask the user to enter a number
8
9      scanf("%d", &n); //we will take a number from user and save it in integer n
10
11     if(n%2==0) //if the value of n%2 is equal to 0 then this means that the remainder of n divided by 2 is 0
12     {
13         printf("The number %d is Even", n); //this will print that the number is Even
14     }
15     else
16     {
17         printf("The number %d is Odd", n); //this will print that the number is odd
18     }
19     return 0; // this return a value of zero to the declared variable
20 }
21
```

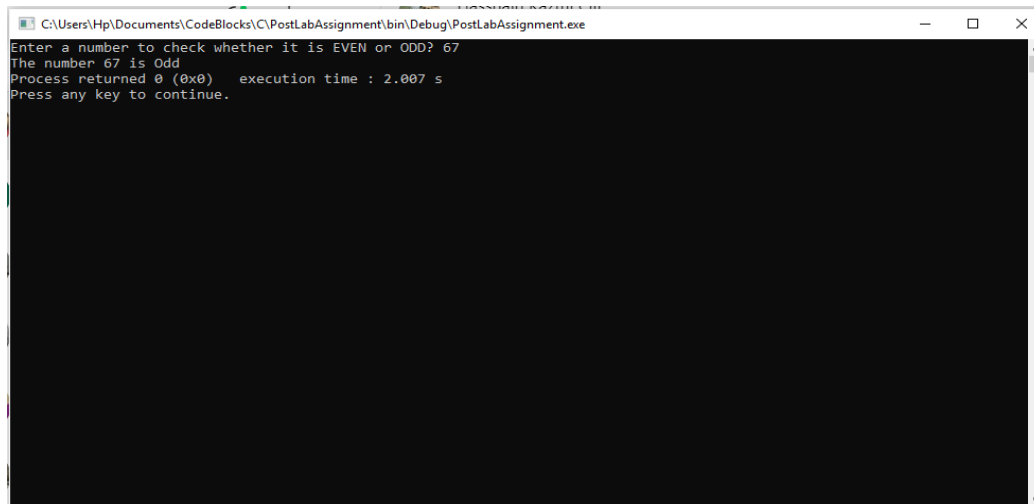
Below I'm attaching the output for one even and one odd value to verify the program,

For Input Value: 66



```
C:\Users\Hp\Documents\CodeBlocks\C\PostLabAssignment\bin\Debug\PostLabAssignment.exe
Enter a number to check whether it is EVEN or ODD? 66
The number 66 is Even
Process returned 0 (0x0)   execution time : 2.574 s
Press any key to continue.
```

For input Value: 67



```
C:\Users\Hp\Documents\CodeBlocks\C\PostLabAssignment\bin\Debug\PostLabAssignment.exe
Enter a number to check whether it is EVEN or ODD? 67
The number 67 is Odd
Process returned 0 (0x0)   execution time : 2.007 s
Press any key to continue.
```

Hence, The Output further verifies that the program is correct, I have also added comments in code and tried to explain it line by line.

_____THE END_____