

# Programming Fundamentals

## Section 1E&1F

### Assignment 3

#### FALL SEMESTER 2020

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Due Date: 18 Dec 2020

Total Marks: 100 Marks

Note: You're required to submit the files accordingly (in instructed format) and by the due date otherwise your submission will not be accepted. Moreover, any sort of plagiarism will result in negative absolutes. (see submission guidelines at the end of this document. ). Moreover You can not use any goto, break or continue statement.

### Section-I (50 Marks)

In this section you're required to develop a console based polynomial calculator in C++. For each polynomial you will take care of its degree and coefficients of all of its terms. Let's assume the degree of polynomials will not exceed 15 i.e. max limit for degree of polynomial will be 15. And, you will store degrees of the polynomial in one array and coefficients in another array.

For example a polynomial  $4x^6 - 2x^3 + 6x^2 + 1$  will be stored as

Terms= 4

Coefficients

4	-2	6	1
---	----	---	---

Degrees

6	3	2	0
---	---	---	---

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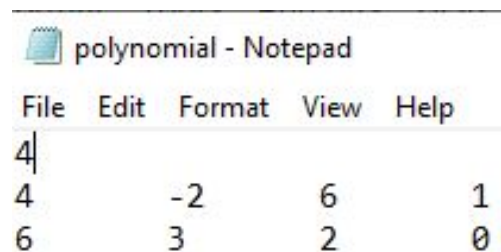
Make sure that degrees of the polynomial calculator are sorted in descending order so that the highest term appears first. Moreover, there must not be any duplicates in the degrees array allocated on the minimum required memory i.e. no of terms.

You will implement the following functions for this section.

1. **Input:** This function will take a polynomial as input. It will populate values for degree and coefficient arrays according to number of terms, by taking all values as input from the user. The prototype of the function is given below.

**void Input( int terms, int deg [], int coef []);**

2. **Input From a File:** The function takes a polynomial as input from a file. Filename will be taken as input from the user. The file will have a pre-defined format as given in the picture below.



In the first line there will be no\_of\_terms. In the second line there will be coefficients of the polynomial separated by '\t'. In the next line there will be degrees of the polynomial corresponding to the coefficients separated by '\t'.

**//overloaded function**

**void Input(char filename[], int& terms, int deg [], int coef []);**

- 
- 3. Solve:** This function will take a polynomial (terms, degrees, coefficients) and a value of variable (x) and will solve it for x= 'the variable value'. Prototype of the function is given below.

**int Solve( int terms, int deg [], int coef [], int variable);**

- 4. Add:** This function will take two polynomials and will add them.

**void Add (int aterms, int addeg [], int acoef [], int bterms, int bdeg [], int bcoef [], int& rterms, int rdeg [], int rcoef [] );**

- 5. Multiply:** This function will take two polynomials and multiply them. Prototype of the function is given below.

**void Multiply( int aterms, int addeg [], int acoef [], int bterms, int bdeg [], int bcoef [], int& rterms, int rdeg [], int rcoef [] );**

- 6. Subtract:** This function will take three polynomials as input and subtract them. Prototype of the function is given below.

**void Subtract( int aterms, int addeg [], int acoef [], int bterms, int bdeg [], int bcoef [], int& rterms, int rdeg [], int rcoef [] );**

- 7. Equal:** This function will take two polynomials and will check if they are equal or not.

**bool Equal(int aterms, int addeg [], int acoef [], int bterms, int bdeg [], int bcoef []);**

- 8. Print:** This function will print a polynomial. The prototype is given below.

**void Print( int terms, int deg [], int coef []);**

**For coefs= {4,-2,6,1} and degrees = {6,3,2,0} it will print the following polynomial as:**

$$4x^6 - 2x^3 + 6x^2 + 1$$

---

**9. Menu:** This function will be implemented to use all of the above functions.

Example of menu options for different values are given below:

0. Input two polynomials from files.
1. Input two polynomials from the user.
2. Solve one of the polynomials for a value. (prints the result as well).
3. Print the polynomials. (if this option entered the user will be asked for selection of any one of these options
  - i. First polynomial.
  - ii. Second polynomial
  - iii. Bothand then the printing will be performed.)
4. Multiply the polynomials. (prints the result as well).
5. Subtract the polynomials.(prints the result as well).
- 6.Add the polynomials (prints the result as well).
7. Exit the program.

## **Section-II**

**(40 Marks)**

In this section you will have to explore graphics and draw some shapes on the console.

### **Setup**

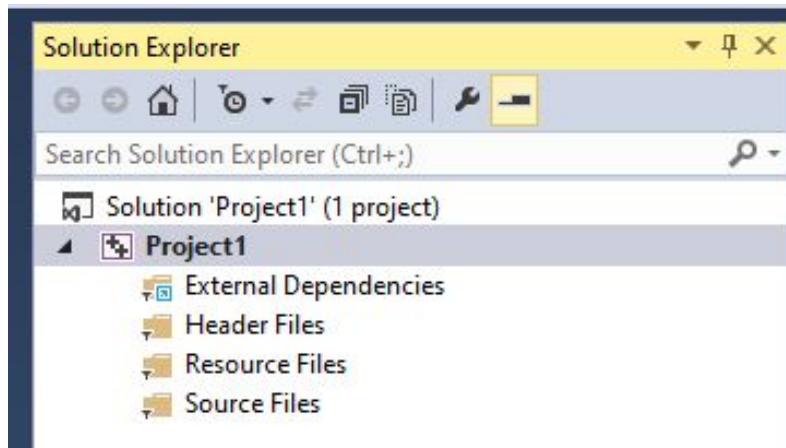
You will be provided with 4 files with this assignment. Using those 4 files you will be able to work with graphics in c++. Names of the files are provided in the picture below.

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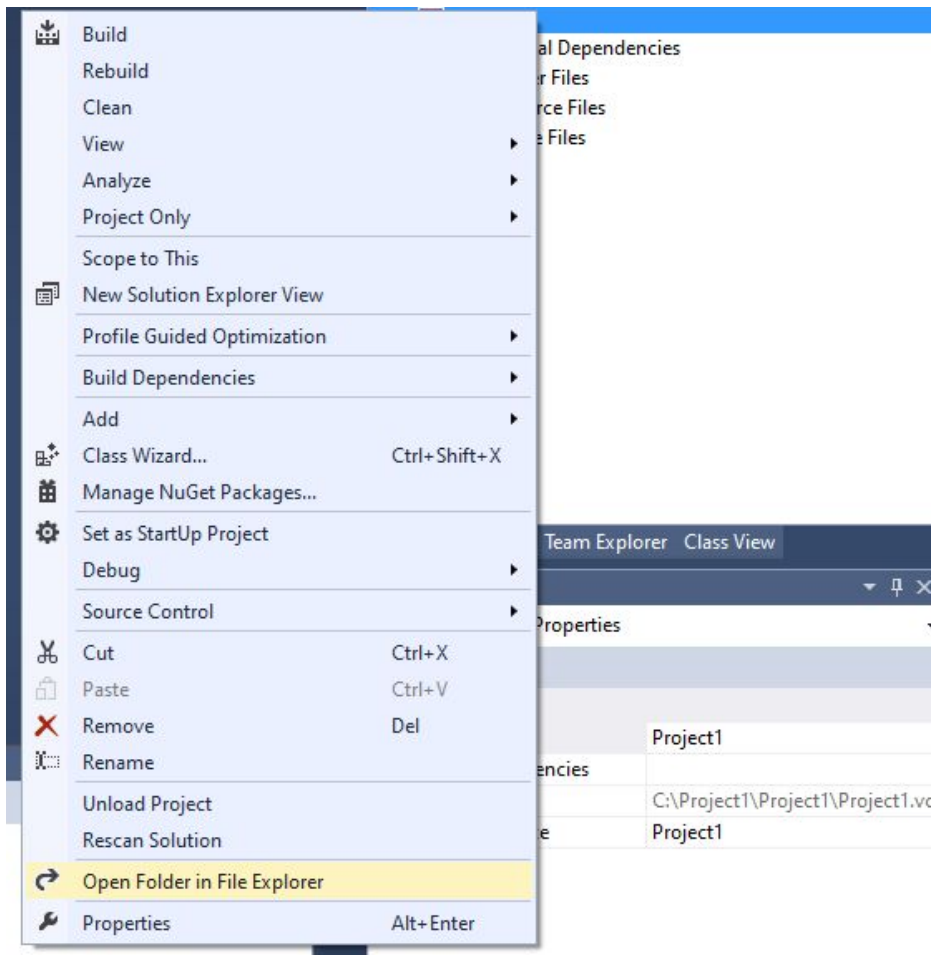
++ myconsole  
📁 myconsole  
++ mygraphics  
📁 mygraphics

To use these files in visual studio create a new project and follow these steps.

In the solution Explorer window right on the name of the project. (in my case Project1).



Click on “Open Folder in File Explorer”.



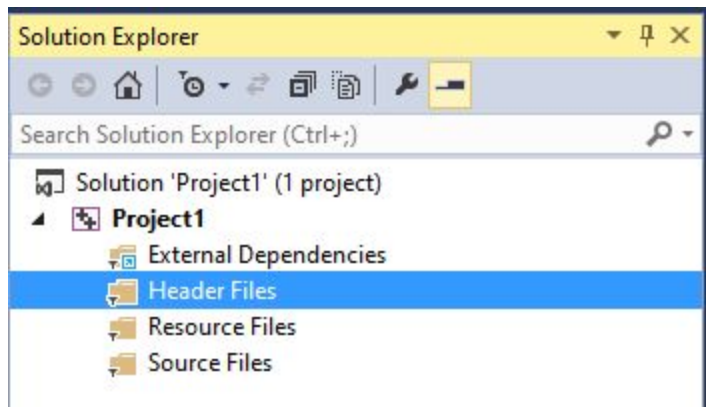
The project folder will be opened in the File Explorer.

Copy the provided four files in the opened file explorer.

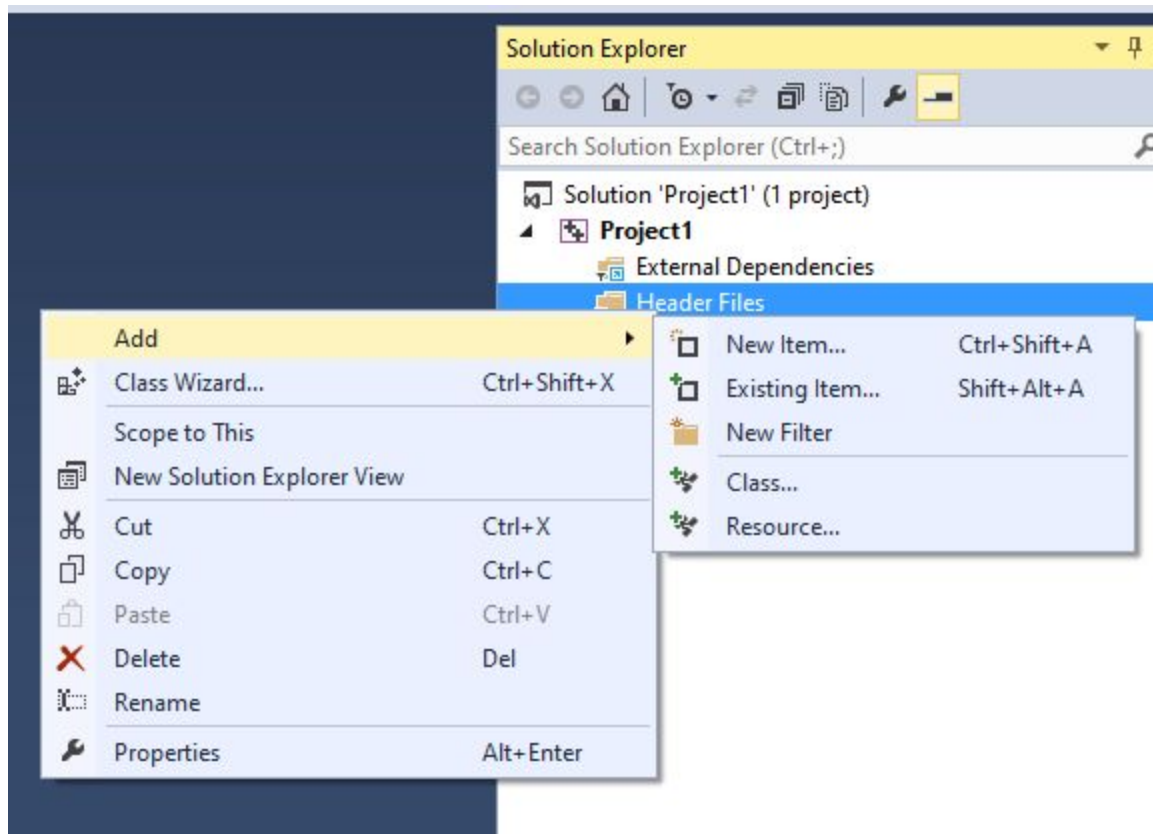
<< Project1 >> Project1		Search Project1		
Name	Date modified	Type	Size	
myconsole	11/23/2017 7:37 AM	C++ Source	5 KB	
myconsole	11/23/2017 7:38 AM	C/C++ Header	3 KB	
mygraphics	11/18/2017 6:58 PM	C++ Source	4 KB	
mygraphics	11/18/2017 6:59 PM	C/C++ Header	3 KB	
Project1	12/7/2020 4:46 PM	VC++ Project	4 KB	
Project1.vcxproj	12/7/2020 4:46 PM	VC++ Project Filte...	1 KB	

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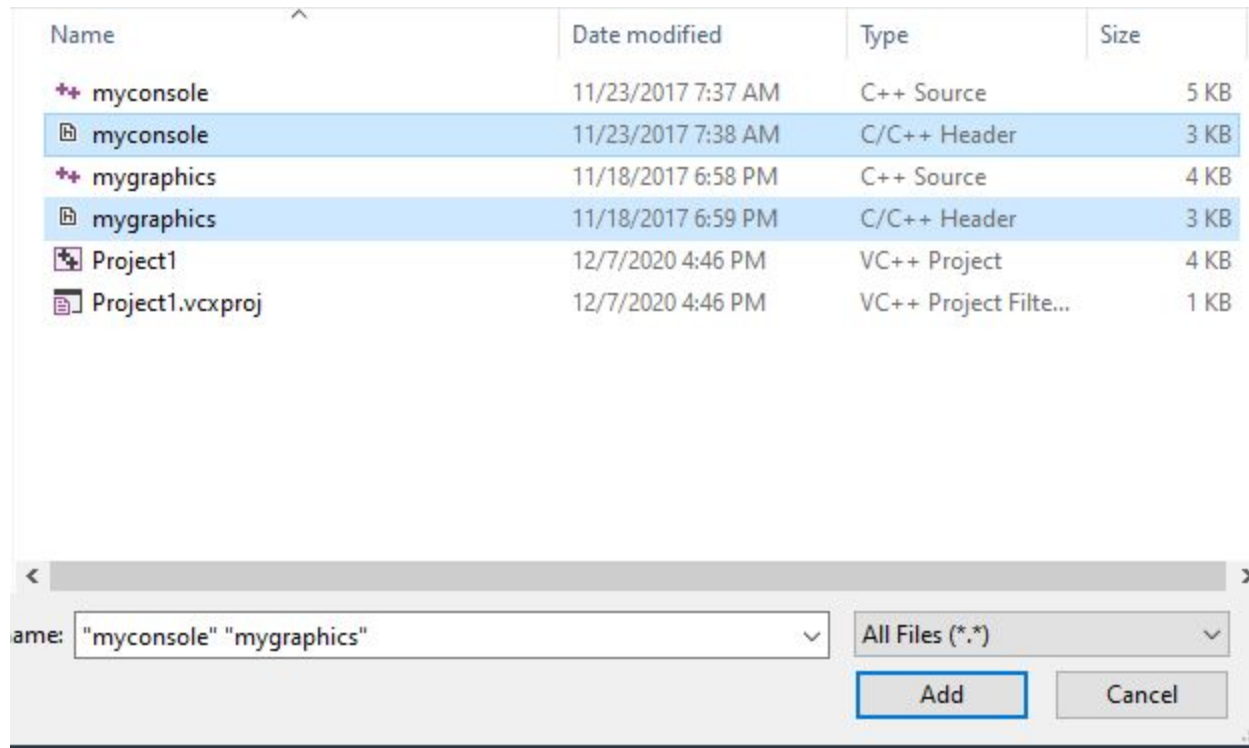
Now go back to the visual studio and right click on Header Files in the solution explorer window.



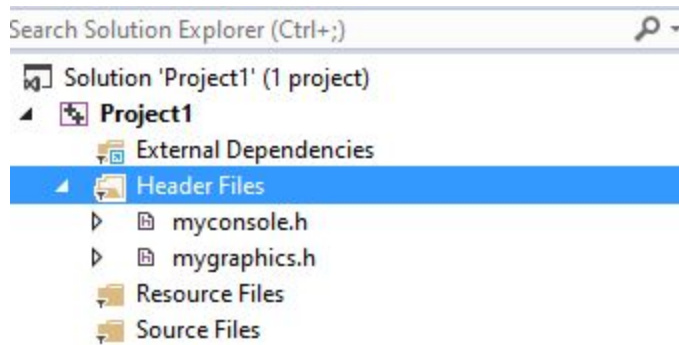
Now click on “Existing Item”.



Select the header files and click on “Add”.

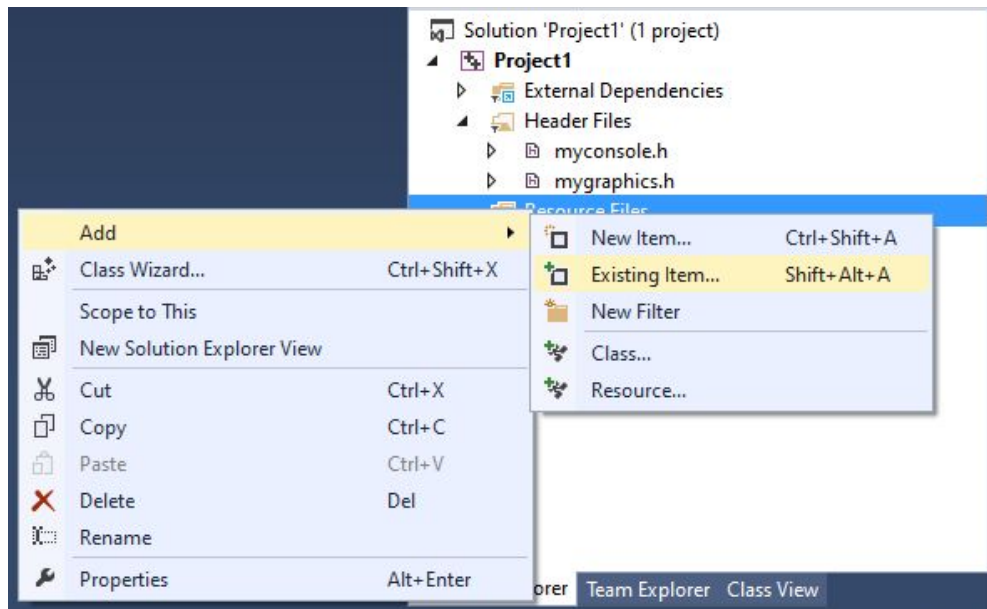


The header files will be added under “Header Files”.

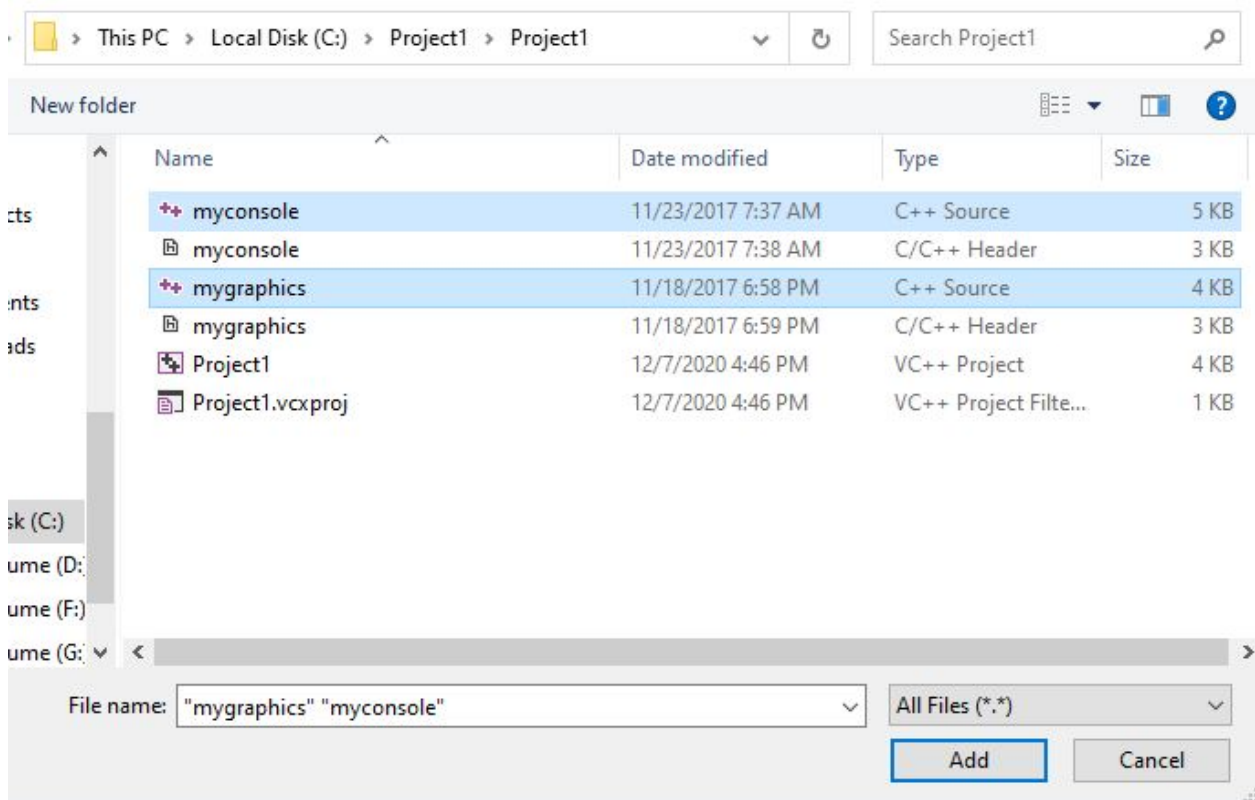


Now right click on “Resource Files” and after clicking on “Add” click on “Existing Item”.

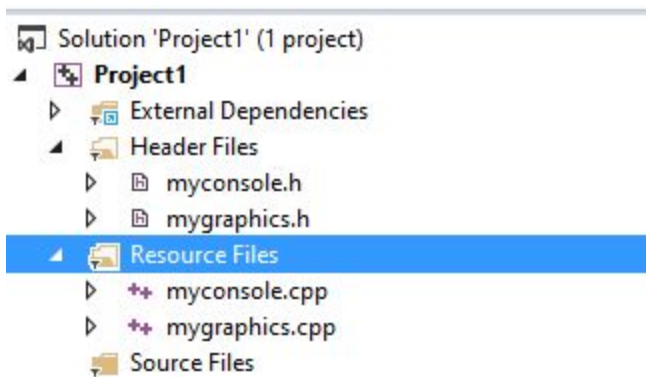




Select the cpp files and click on the Add button.



Finally graphics files are added to the project.



Now add a source file and add these two lines in the source file at the top.

```
#include<iostream>
#include"mygraphics.h"
#include"myconsole.h"
```

## Question 1

(5 Marks)

After setting up the project with graphics files, explore the functions in mygraphics.h file.

Use myLine function to print a diagonal line on the console.

myLine function takes x1,y1,x2,y2 ; the position of the line coordinates on the console. Moreover, the colorref is a color type which takes RGB value (primary colors; Red, Green, Blue) ranging from 0 to 255.

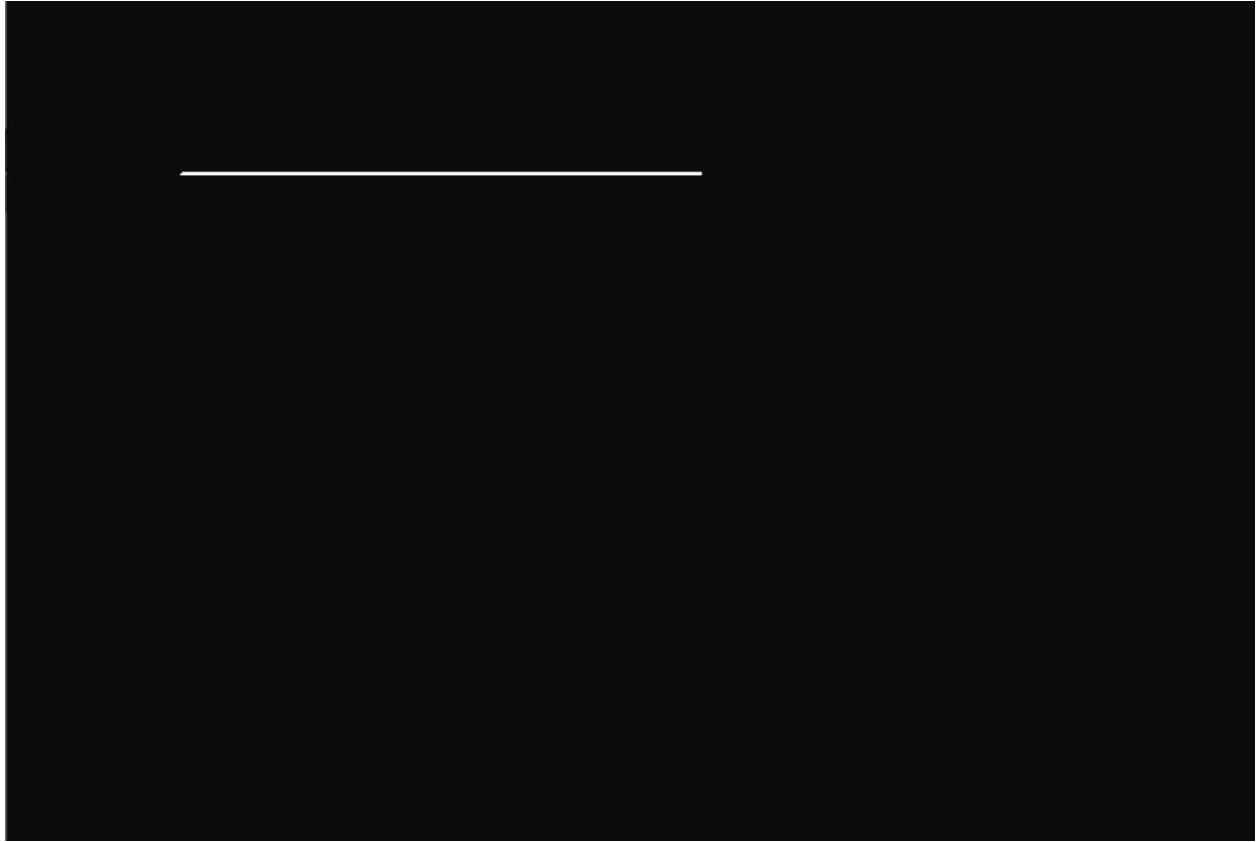
To print a straight line try the given code below.

```
(Global Scope)
#include<iostream>
#include"mygraphics.h"
#include"myconsole.h"
#include<conio.h> //To use _getch() function

int main()
{
    COLORREF White = RGB(255, 255, 255);
    myLine(100,100, 400, 100, White);
    _getch(); //wait for a key press
}
```

---

The above code will output this line on the screen.



Your task is to print a diagonal line on the screen configuring the values of `x1,x2,y1,y2` accordingly.

## Question 2

(5 Marks)

Now explore the `myRect` function and print a rectangle at top right of the screen. For example the following code will give a rectangle like the output screen provided below.

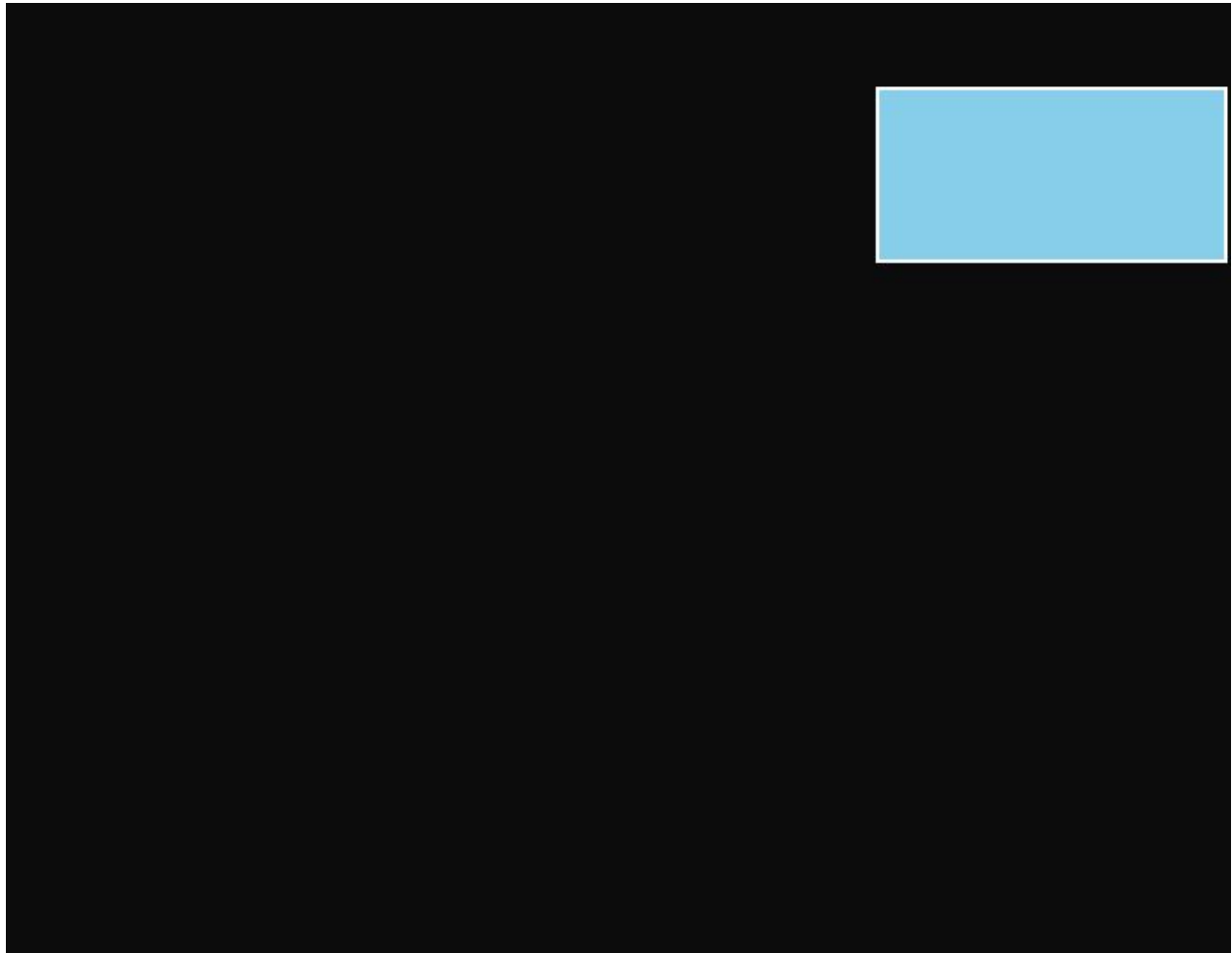
---

```
#include<iostream>
#include"mygraphics.h"
#include"myconsole.h"
#include<conio.h> //To use _getch() function

int main()
{
    COLORREF White = RGB(255, 255, 255);
    //      x1, y1, x2, y2 , border, fill
    myRect(100,100, 400, 200, White,White);
    _getch(); //wait for a key press
}
```



Now your task is to print a small rectangle on the top right of the screen with white border and sky blue fill like the screen below.



### Question 3

(5 Marks)

Draw a circle in red color on screen using myEllipse function.

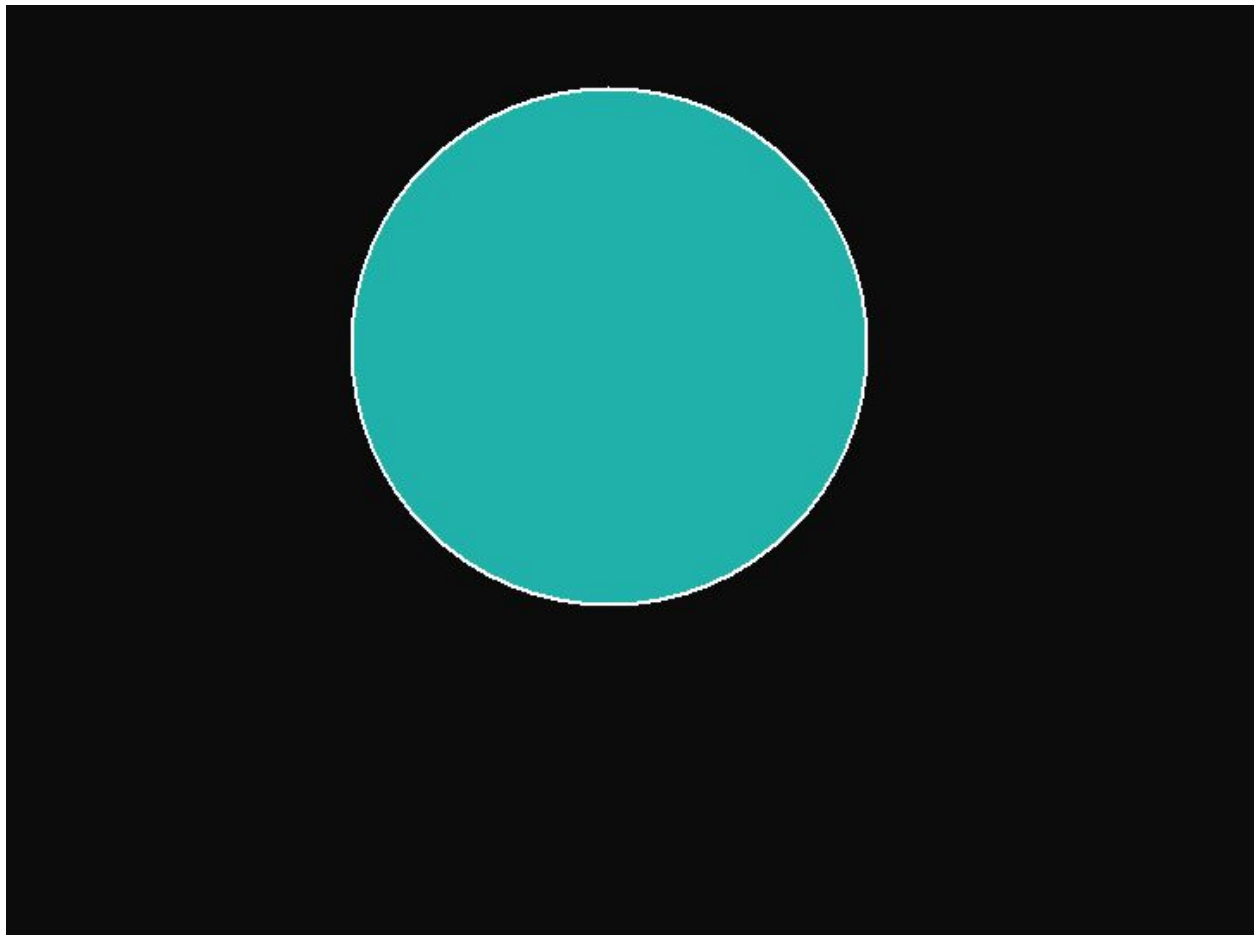
For example:

Code:

```
(Global Scope)
#include<iostream>
#include"mygraphics.h"
#include"myconsole.h"
#include<conio.h> //To use _getch() function

int main()
{
    COLORREF White = RGB(255, 255, 255);
    COLORREF SeaGreen = RGB(32,178,170);
    //      x1, y1, x2, y2 , border, fill
    myEllipse(200, 50, 500, 350, White, SeaGreen);
    _getch(); //wait for a key press
}
```

Output:



Your task is to print a circle of Red color at the top left corner of the screen.

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## Question 4

(10 Marks)

You can use the for loop and myLine function to print a triangle.

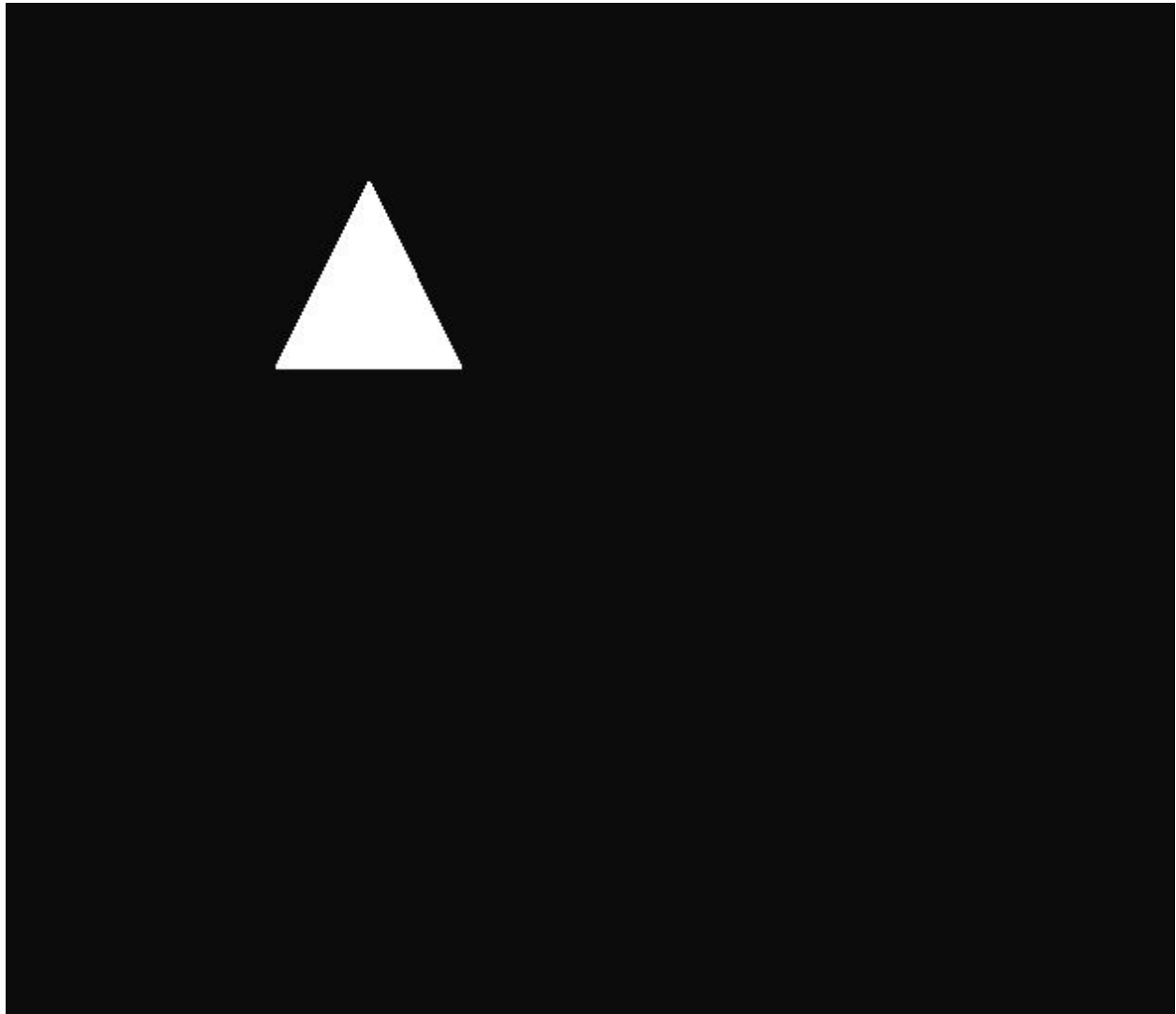
For example:

Code:

```
#include<iostream>
#include"mygraphics.h"
#include"myconsole.h"
#include<conio.h> //To use _getch() function

int main()
{
    COLORREF White = RGB(255, 255, 255);
    COLORREF SeaGreen = RGB(32,178,170);
    //      x1, y1, x2, y2 , border, fill
    int x1 = 200;
    int y1 = 100;
    int size = 50;
    for (int i = -size; i < size; i++)
    {
        //      x1, y1, x2, y2 , border, fill
        myLine(x1, y1, x1 + i, y1 + 100, White);
    }
    _getch(); //wait for a key press
}
```

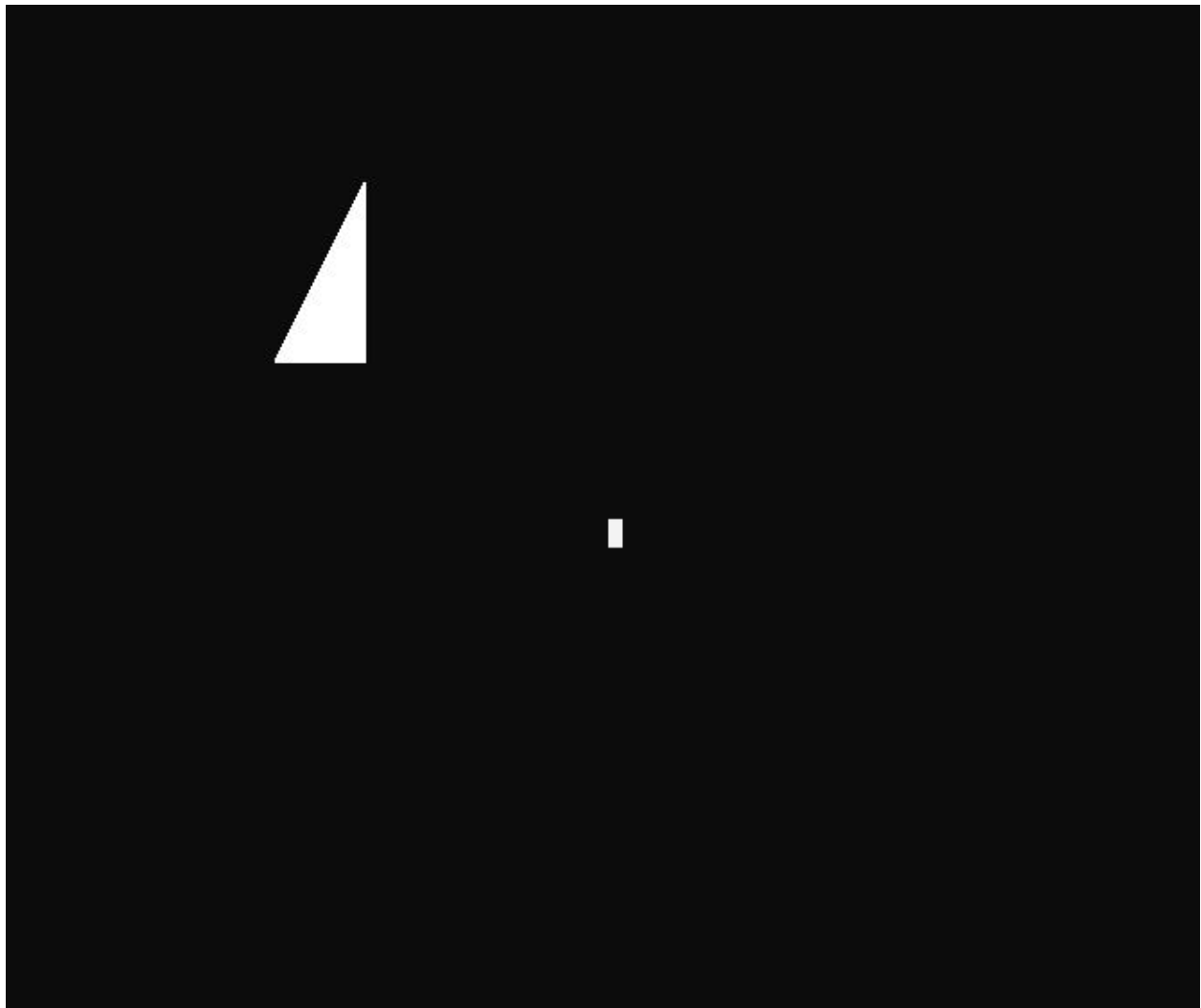
Output:



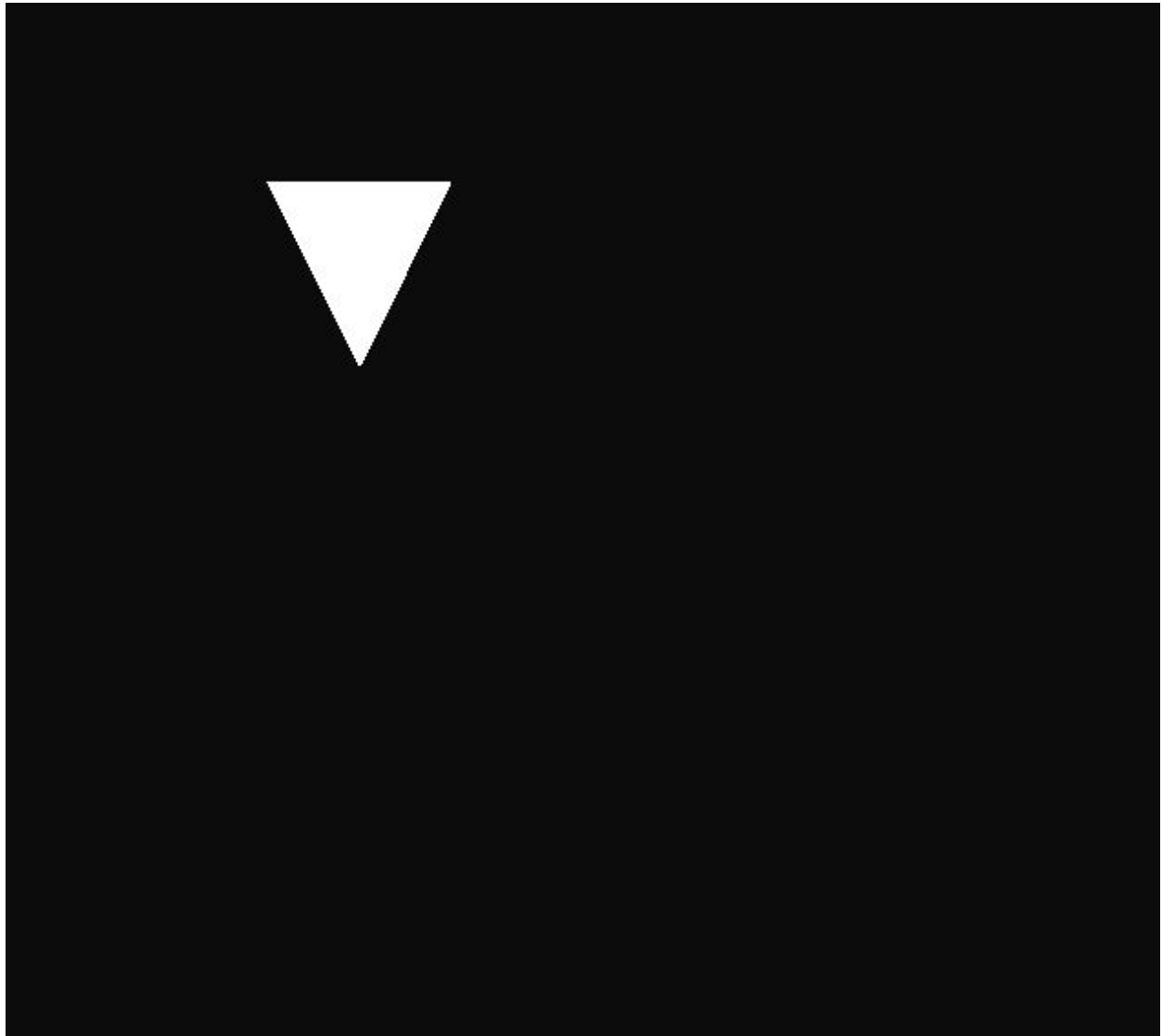
Your tasks are

1. print a horizontally inverted right triangle using for loop and the myLine function.





2. Print a triangle inverted vertically using for loop and myLine function.



### Question 5

(5 Marks)

Now your task is to make a menu for all of the above functions using myDrawText function.

Code:


---

```
int main()
{
    COLORREF Black = RGB(0, 0, 0);
    COLORREF White = RGB(255, 255, 255);
    bool exit = false;
    while (exit == false)
    {
        myDrawText(10, 10, 25, "Welcome to the Menu.", Black, White);
        myDrawText(10, 30, 25, "Press p to print triange", Black, White);
        myDrawText(10, 50, 25, "Press x to Exit", Black, White);
        char ch = _getch();
        if (ch == 'p')
        {
            //      x1, y1, x2, y2 , border, fill
            int x1 = 200;
            int y1 = 100;
            int size = 50;
            for (int i = -size; i < size; i++)
            {
                //      x1, y1, x2, y2 , border, fill
                myLine(x1 + i, y1, x1, y1 + 100, White);
            }
            Sleep(2000); // wait for 2 seconds
        }
        else if (ch == 'x')
            exit = true;
        ClearScreen();
    }
    return 0;
}
```

---

Output:

---



```
Welcome to the Menu.  
Press p to print triange  
Press x to Exit
```

Your task is to make a menu for all of the above questions. E.g. Draw a Line, Draw a Circle, rectangle, Triangle on the screen.

### **Submission Guidelines**

For this assignment you will submit only two cpp (last questions of the both sections) files zipped in one zip file (l20\_abcd.zip); one for each section i.e.

1. l20\_abcd\_section\_1.cpp
2. l20\_abcd\_section\_2.cpp