

GNG1106 Lab 1

Compute the Area of a Triangle

1. **Problem:**

The problem for this lab is to write a program using C code that computes or outputs the area of a triangle when given the x and y-coordinates of three points on the xy-plane as the input.

2. **Input/ Output Description:**

- **Input-** The input for this problem is the values for x and y-coordinates of three points on the xy-plane that form a triangle. These values are inputted by the user through the keyboard.
- **Output-** The output for this problem is the display on the monitor of the values inputted by the user as well as the display of the final area of the triangle created by the three points, or in the case where the three points do not form a triangle a message is displayed saying that the area cannot be computed.

### 3. Flowchart:

#### 1. Input

Values for the x and y-coordinates of three points on the xy-plane that form a triangle, entered by the user

#### 2. Computation

$$\text{Area} = |[x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)]/2|$$

#### 3. Output

Print the values for the x and y-coordinates of the three points entered by the user and print the area of the triangle formed by the three points or

#### 4. Comparison

If the values for the x and y-coordinates of the three points on the xy-plane form a triangle then...

##### Yes

The area of the triangle formed can be calculated using the formula in the program and the area is displayed on the monitor

##### No

The area cannot be calculated by the program and a message will be displayed saying that the points do not form a triangle

#### 5. Beginning of Algorithm

```
int main()/ start main
```

#### 6. End of Algorithm

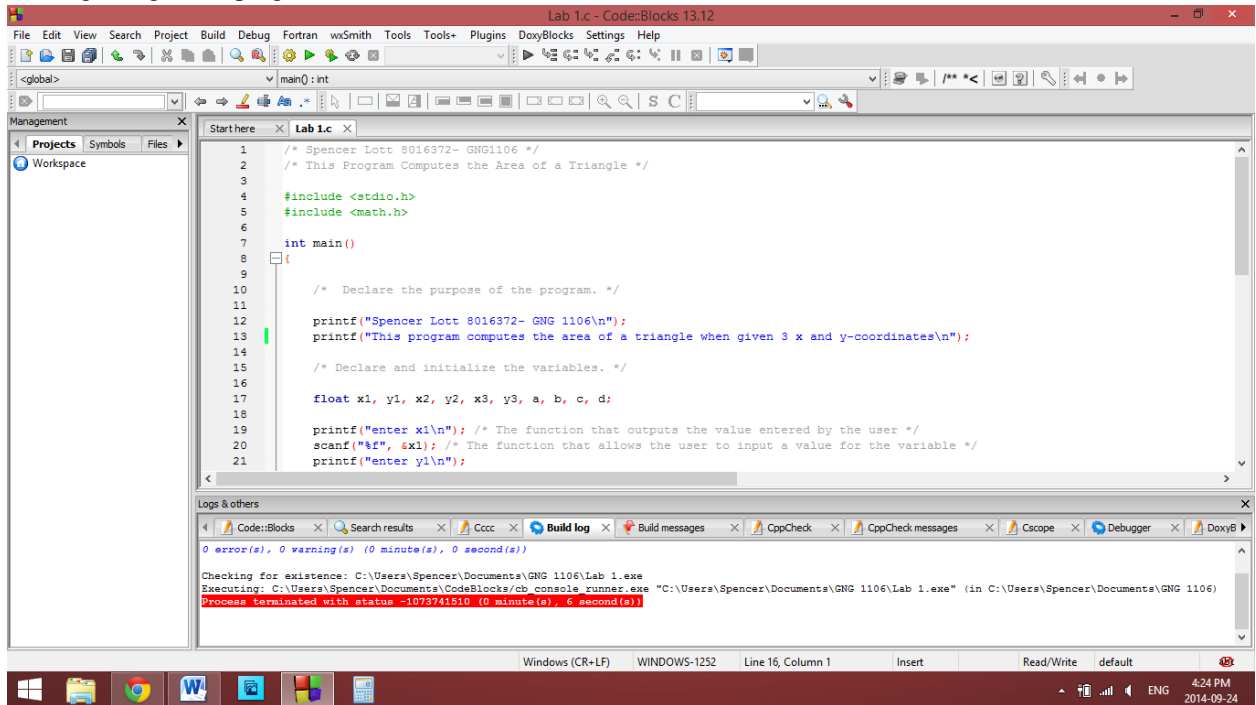
```
return 0;/ stop main
```

### 4. Writing the C code in CodeBlocks:

The C source file is attached

## 5. Testing the Program:

- The beginning of the program in CodeBlocks



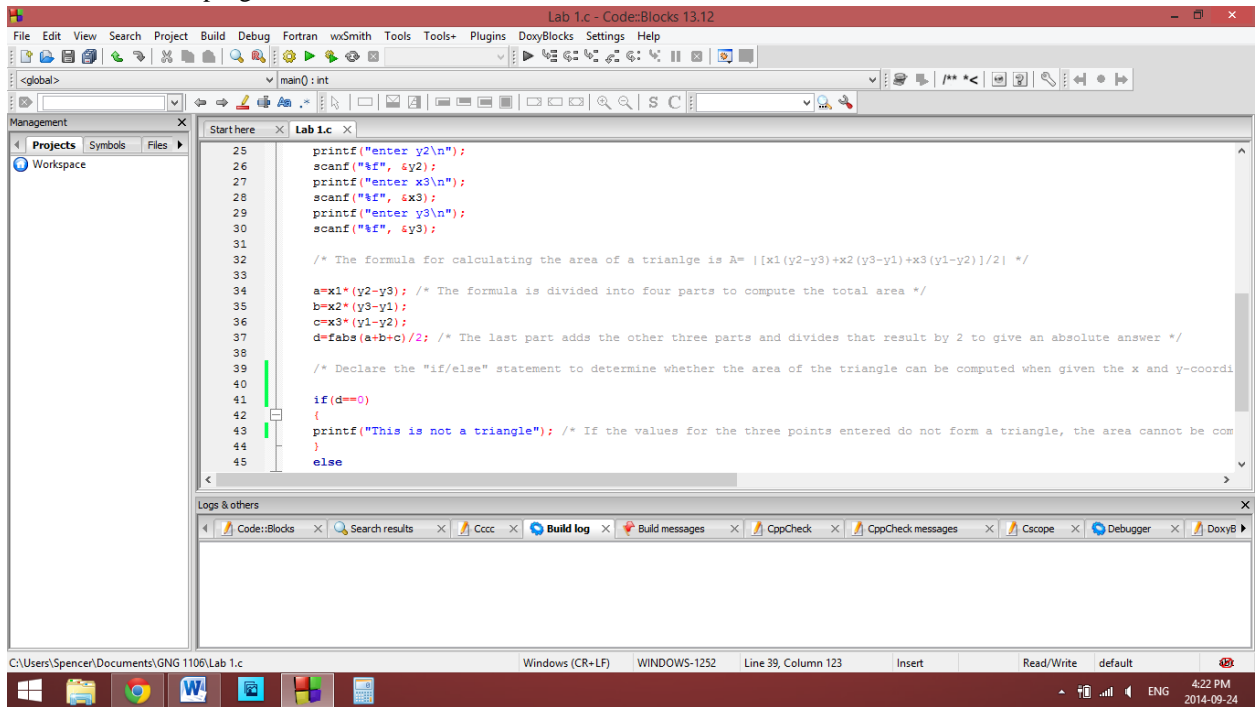
The screenshot shows the CodeBlocks IDE with a C++ program. The code includes headers for `stdio.h` and `math.h`, and defines a `main` function. It uses `printf` for output and `scanf` for input. The program is titled "Lab 1.c - Code::Blocks 13.12".

```
1 /* Spencer Lott 8016372- GNG1106 */
2 /* This Program Computes the Area of a Triangle */
3
4 #include <stdio.h>
5 #include <math.h>
6
7 int main()
8 {
9
10 /* Declare the purpose of the program. */
11
12 printf("Spencer Lott 8016372- GNG 1106\n");
13 printf("This program computes the area of a triangle when given 3 x and y-coordinates\n");
14
15 /* Declare and initialize the variables. */
16
17 float x1, y1, x2, y2, x3, y3, a, b, c, d;
18
19 printf("enter x1\n"); /* The function that outputs the value entered by the user */
20 scanf("%f", &x1); /* The function that allows the user to input a value for the variable */
21 printf("enter y1\n");
```

The "Logs & others" window shows the following output:

```
0 error(s), 0 warning(s) (0 minute(s), 0 second(s))
Checking for existence: C:\Users\Spencer\Documents\GNG 1106\Lab 1.exe
Executing: C:\Users\Spencer\Documents\CodeBlocks\cb_console_runner.exe "C:\Users\Spencer\Documents\GNG 1106\Lab 1.exe" (in C:\Users\Spencer\Documents\GNG 1106)
Process terminated with status -1073741510 (0 minute(s), 6 second(s))
```

- The middle of the program in CodeBlocks

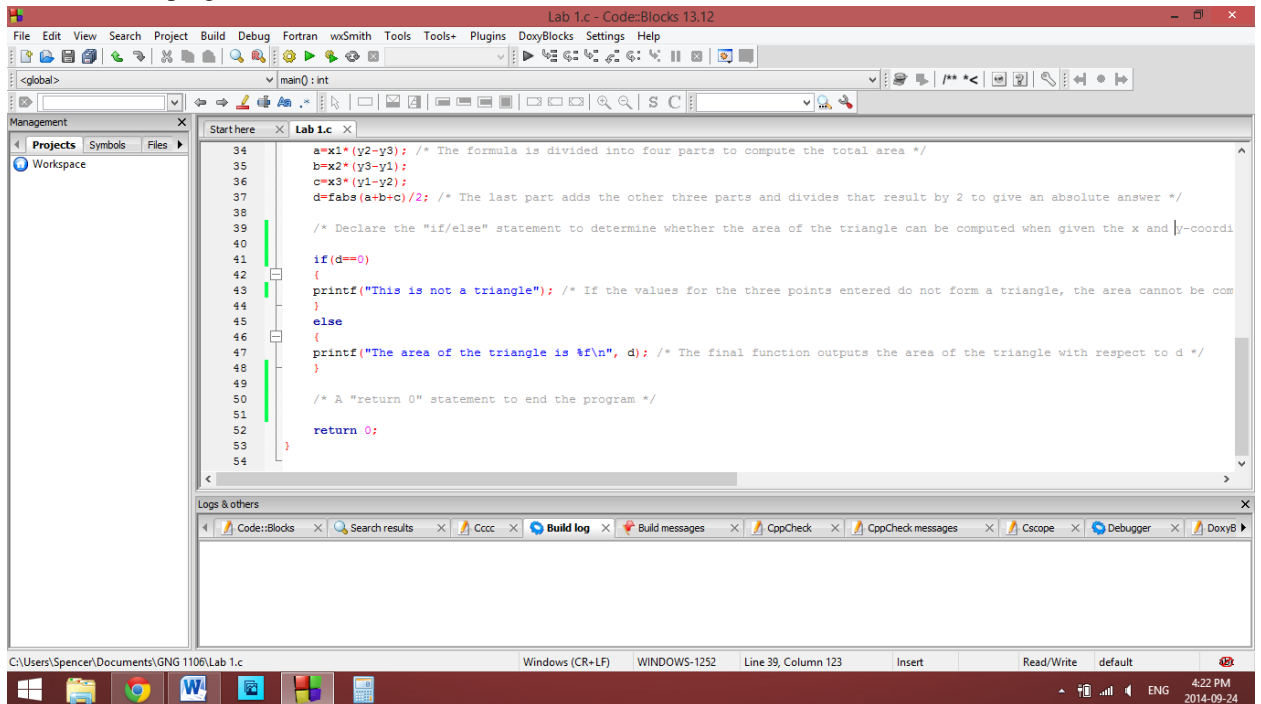


The screenshot shows the middle of the C++ program. It continues from the previous screenshot, adding the calculation of the area using Heron's formula and a conditional check to ensure the three points form a valid triangle. The program is titled "Lab 1.c - Code::Blocks 13.12".

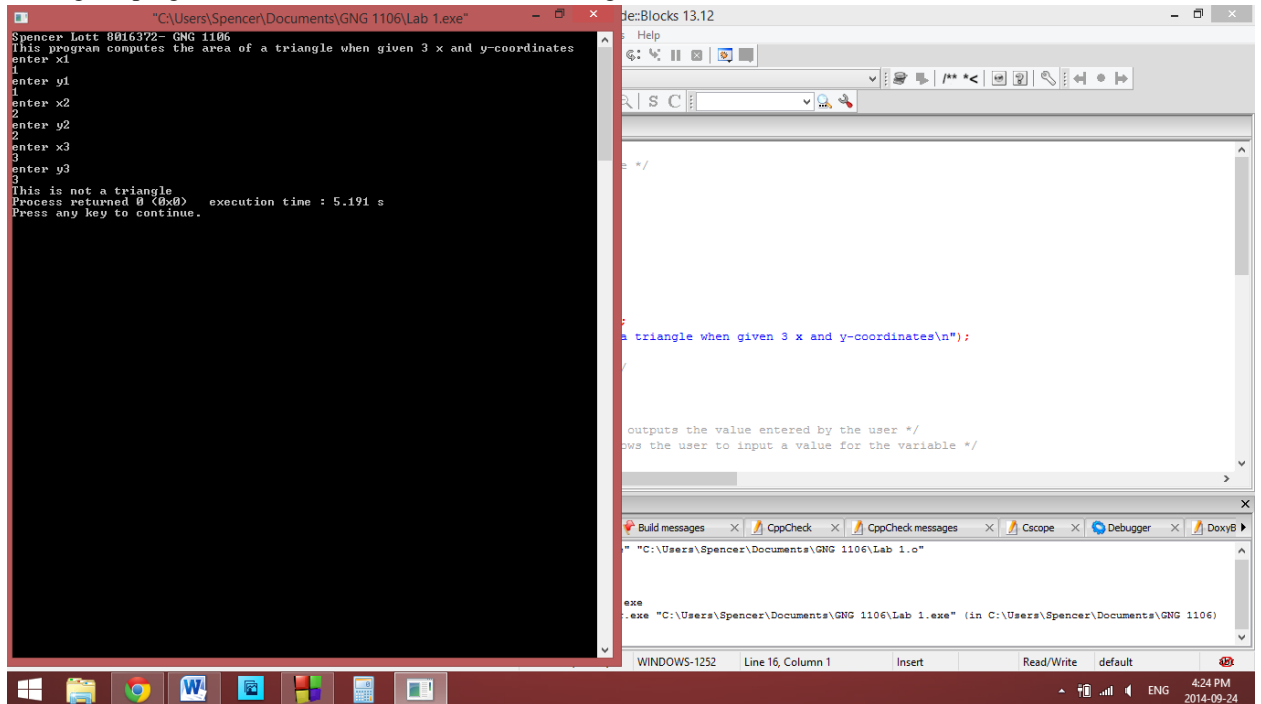
```
25 printf("enter y2\n");
26 scanf("%f", &y2);
27 printf("enter x3\n");
28 scanf("%f", &x3);
29 printf("enter y3\n");
30 scanf("%f", &y3);
31
32 /* The formula for calculating the area of a triangle is A= |[x1(y2-y3)+x2(y3-y1)+x3(y1-y2)]/2| */
33
34 a=x1*(y2-y3); /* The formula is divided into four parts to compute the total area */
35 b=x2*(y3-y1);
36 c=x3*(y1-y2);
37 d=fabs(a+b+c)/2; /* The last part adds the other three parts and divides that result by 2 to give an absolute answer */
38
39 /* Declare the "if/else" statement to determine whether the area of the triangle can be computed when given the x and y-coordi
40
41 if(d==0)
42 {
43 printf("This is not a triangle"); /* If the values for the three points entered do not form a triangle, the area cannot be com
44 }
45 else
```

The "Logs & others" window is empty.

- The end of the program in CodeBlocks



- Testing the program with values that do not form a triangle



- Testing the program with values that do form a triangle

```

Spencer Lott 8616372- GNG 1106
This program computes the area of a triangle when given 3 x and y-coordinates
enter x1
-9
enter y1
1.234
enter x2
9.851
enter y2
67
enter x3
4
enter y3
128
The area of the triangle is 146.200531
Process returned 0 (0x0)   execution time : 19.397 s
Press any key to continue.
  
```

The screenshot also shows the CodeBlocks IDE with the source code for the program:

```

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

int main()
{
    double x1, y1, x2, y2, x3, y3;
    printf("This program computes the area of a triangle when given 3 x and y-coordinates\n");
    printf("Enter x1: ");
    scanf("%lf", &x1);
    printf("Enter y1: ");
    scanf("%lf", &y1);
    printf("Enter x2: ");
    scanf("%lf", &x2);
    printf("Enter y2: ");
    scanf("%lf", &y2);
    printf("Enter x3: ");
    scanf("%lf", &x3);
    printf("Enter y3: ");
    scanf("%lf", &y3);
    double area = 0.5 * ((x2 - x1) * y3 + (x3 - x1) * y2 - (x3 - x2) * y1);
    printf("The area of the triangle is %lf\n", area);
    return 0;
}
  
```

## 6. Complications and Solutions for the Lab:

- The first complication that I encountered while writing this program was the choosing of an appropriate formula for calculating the area of a triangle when given the x and y-coordinates of three points on the xy-plane. I solved this issue by researching possible formulae and choosing one that I felt I could appropriately and correctly incorporate into my program on CodeBlocks.
- The next obstacle that I overcame during this lab was writing code to allow a user to input values for the x and y-coordinates of the three points of the triangle and having those values displayed on the monitor. I solved this obstacle by reading the textbook and reviewing my lecture notes to determine how to use the “printf()” and “scanf()” functions.
- Another problem that I came across during the writing of my program was how to implement my chosen formula in CodeBlocks. I overcame this issue by breaking the formula into four parts and having each aspect of the formula computed separately and relating each variable to the final answer of the formula, being the area of the triangle.
- The final problem that I had to work with while completing this lab was how to write an “if/ else statement”. I used the textbook and trial and error to figure out how to write my “if statement” and compute the response as well as writing the “else statement” and computing the response to that statement too.
- Throughout this lab I learned many things about the CodeBlocks program and about writing C code. I learned how to implement a formula in multiple parts as a code, I learned how to correctly use the “printf()” and “scanf()” functions, and I also learned how to properly write an “if/ else statement”.