

# Lab #1a

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ELEC2850 Microcontrollers Using C Programming

September 10, 2024

## 1 Problem Statement

Create a program that will calculate the area of any triangle with sides  $a$ ,  $b$ , and  $c$ . The program will then output the area of the triangle, using Heron's formula. If the area is negative it will prompt the user that the triangle cannot exist.

## 2 Algorithm

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**Algorithm 1** Triangle Calculation

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```
1:  $a \leftarrow$  input from user for side a
2:  $b \leftarrow$  input from user for side b
3:  $c \leftarrow$  input from user for side c
4:  $s \leftarrow \frac{a+b+c}{2}$ 
5:  $area \leftarrow \sqrt{s(s-a)(s-b)(s-c)}$ 
6: if  $s < 0$  then 0 return Not a triangle
7: return  $area$ 
```

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### 3 Flowchart

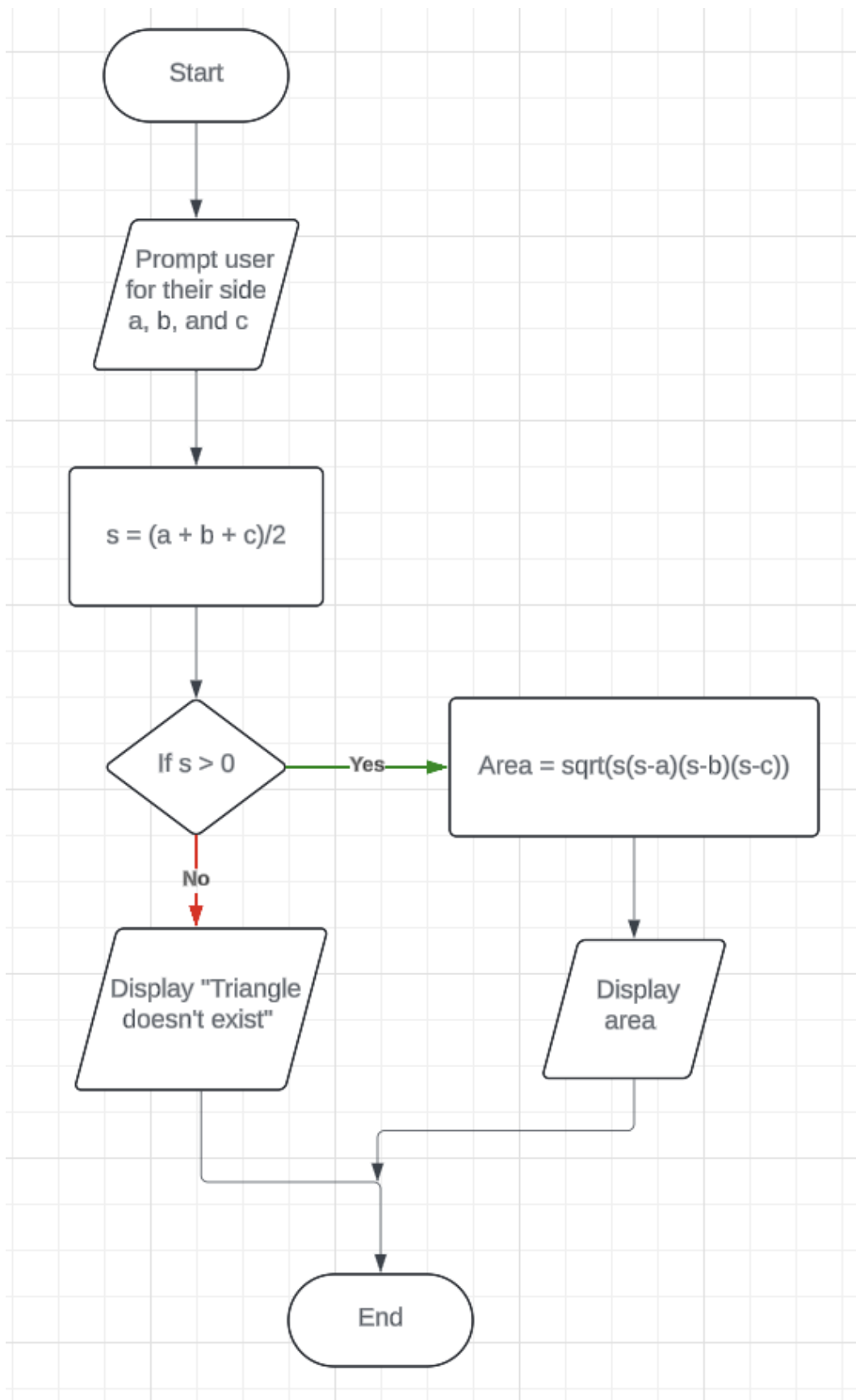


Figure 1: Flowchart for the program.

## 4 Part 2

### 4.1 Question 1

The code does not include the library `stdio.h`, `vscode` and `GCC` will fix in the precompile stage, however adding `stdio.h` will fix the issue.

```
1 // Lab Exercise 1a, Part 2, Question 1
2 #include <stdio.h>
3
4 int main()
5 {
6     printf("Lab Exercise 1a, Part 2, Question 1\n");
7
8     return 0;
9 }
```

Figure 2: The code for question 1.

A terminal window showing the output of the program for Question 1. The text "Lab Exercise 1a, Part 2, Question 1" is displayed in a monospaced font with a light blue background.

Figure 3: Output of Q1.

### 4.2 Question 2

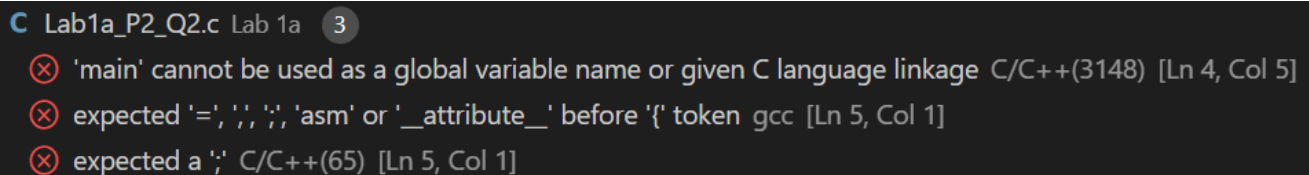
A screenshot of the VSCode error lens for a file named "Lab1a\_P2\_Q2.c". It shows three error messages: 1. "'main' cannot be used as a global variable name or given C language linkage C/C++(3148) [Ln 4, Col 5]". 2. "expected '=', ',', ';', 'asm' or '\_\_attribute\_\_' before '{' token gcc [Ln 5, Col 1]". 3. "expected a ';' C/C++(65) [Ln 5, Col 1]". Each message is preceded by a red circle with a white 'x' icon.

Figure 4: Error message with VSCode error lens Q2.c

Fixing this problem requires only adding `()` after `main`. This will allow the code to compile as `C` recognizes it as a function now.

```
1 //Lab Exercise 1a, Part 2, Question 2
2 #include<stdio.h>
3
4 int main()
5 {
6     printf("Lab Exercise 1a, Part 2, Question 2\n");
7
8     return 0;
9 }
```

Figure 5: The code for question 2.

A terminal window showing the output of the program for Question 2. The text "Lab Exercise 1a, Part 2, Question 2" is displayed in a monospaced font with a light blue background.

Figure 6: Output of Q2.

### 4.3 Question 3

There was no error in Q3 however because our main function is an int, it must return 0 to safely exit the program.

```
1 // Lab Exercise 1a, Part 2, Question 3
2 #include <stdio.h>
3
4 int main()
5 {
6     printf("This still works because the IDE allows it but there is something missing\n");
7     printf("Add the line of code that is missing\n");
8
9     return 0;
10 }
```

Figure 7: The code for question 3.

```
This still works because the IDE allows it but there is something missing
Add the line of code that is missing
```

Figure 8: Output of Q3.

### 4.4 Question 4

```
✓ C Lab1a_P2_Q4.c Lab 1a 2
⊗ expected a declaration C/C++(169) [Ln 5, Col 2]
⊗ expected a '{' C/C++(130) [Ln 7, Col 2]
```

Figure 9: Error message with VSCode error lens Q4.c

Fixing this error requires adding a { to the beginning of the main function. This is because C doesn't understand where the function starts.

```
1 // Lab Exercise 1a, Part 2, Question 4
2 #include <stdio.h>
3
4 int main()
5 {
6     printf("Lab exercise 1a, Part 2, Question 4\n");
7
8     return 0;
9 }
```

Figure 10: The code for question 4.

```
Lab exercise 1a, Part 2, Question 4
```

Figure 11: Output of Q4.

## 4.5 Question 5

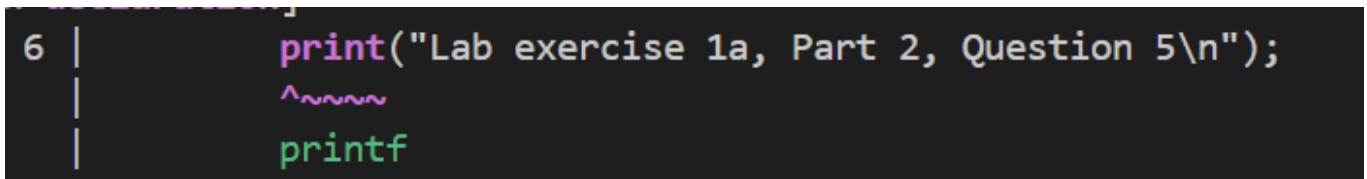


Figure 12: Error message when compiling Q5.c

The function `print()` does not exist and is instead `printf`. Changing this will allow the code to compile.

```
1 // Lab Exercise 1a, Part 2, Question 5
2 #include <stdio.h>
3
4 int main()
5 {
6     printf("Lab exercise 1a, Part 2, Question 5\n");
7
8     return 0;
9 }
```

Figure 13: The code for question 5.



Figure 14: Output of Q5.

## 4.6 Question 6

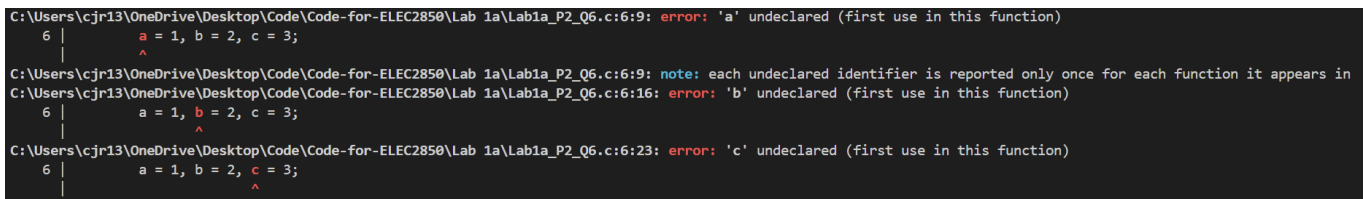


Figure 15: Error message when compiling Q6.c

The variables `a`, `b`, and `c` have not been declared so C hasn't allocated memory for them. Adding `int` or `float` in front of them will fix this issue.

```
1 // Lab Exercise 1a, Part 2, Question 6
2 #include <stdio.h>
3
4 int main()
5 {
6     int a = 1, b = 2, c = 3;
7
8     printf("The value of a is %d, b is %d, and c is %d\n", a, b, c);
9
10    return 0;
11 }
```

Figure 16: The code for question 6.

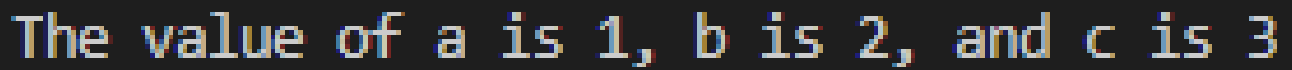
A terminal window with a black background and light blue text. The text reads: "The value of a is 1, b is 2, and c is 3".

Figure 17: Output of Q6.

#### 4.7 Question 7

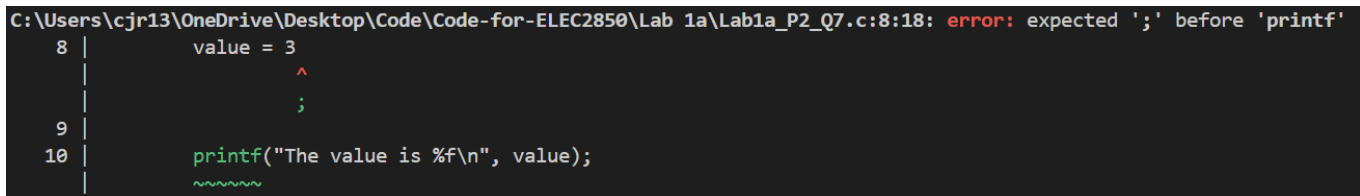
A screenshot of a code editor showing a compilation error. The error message is: "C:\Users\cjr13\OneDrive\Desktop\Code\Code-for-ELEC2850\Lab 1a\Lab1a\_P2\_Q7.c:8:18: error: expected ';' before 'printf'". The code snippet shows line 8: "value = 3" and line 10: "printf("The value is %f\n", value);". A red caret points to the end of line 8, and a red squiggly line is under the "printf" function.

Figure 18: Error message when compiling Q7.c

Line 8 wasn't properly ended with a ;. Adding this will fix the issue, and stop C from reading the line as (value=3printf...)

```
1 //Lab Exercise 1a, Part 2, Question 7
2 #include<stdio.h>
3
4 int main()
5 {
6     float value;
7
8     value = 3;
9
10    printf("The value is %f\n", value);
11
12    return 0;
13 }
```

Figure 19: The code for question 7.

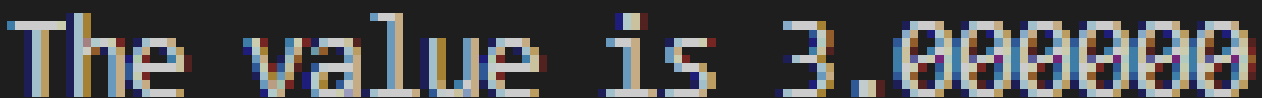
A terminal window with a black background and light blue text. The text reads: "The value is 3.000000".

Figure 20: Output of Q7.

#### 4.8 Question 8

Because %d is being used instead of %f the output is 0 instead of 28.50. Changing %d to %f will fix this issue.

A terminal window with a black background and white text. The text reads "The value is 0".

Figure 21: The output for Q8.

```
1 // Lab Exercise 1a, Part 2, Question 8
2 #include <stdio.h>
3
4 int main()
5 {
6     float value;
7
8     value = 28.50;
9
10    printf("The value is %f\n", value);
11
12    return 0;
13 }
```

Figure 22: The code for question 8.

A terminal window with a black background and white text. The text reads "The value is 28.500000".

Figure 23: Output of Q8.

## 4.9 Question 9

A terminal window with a black background and white text. The text reads "The root1 is 3.510000 and root2 is 0.000000".

Figure 24: The output for Q9.

The output for root2 is 0 because the variable for root2 is not included in the printf statement. Adding root2 after root1 to the printf statement will fix this issue.

```
1 //Lab Exercise 1a, Part 2, Question 9
2 #include <stdio.h>
3
4 int main()
5 {
6     float root1 = 3.51, root2 = 4.71;
7
8     printf("The root1 is %f and root2 is %f\n", root1, root2);
9
10    return 0;
11 }
```

Figure 25: The code for question 9.

The root1 is 3.510000 and root2 is 4.710000

Figure 26: Output of Q9.

## 5 Part 3

```
1 #include <stdio.h>
2
3 void main()
4 {
5     int phones = 100;                                // Start with
6     int addedPhones = 10;                             // add ten
7     int lines = (phones * (phones - 1)) / 2;           // Calculate
8     int linesNeededFuture = ((phones + addedPhones) * (phones + addedPhones - 1)) / 2; // Calculate
9     int linesNeeded = linesNeededFuture - lines;       // Calculate
10    printf("The number of lines needed for %d telephones is %d with %d additional lines needed for %d more telephones.",
11           phones, lines, linesNeeded, addedPhones); // Print the number of lines needed for 100
12 }
```

Figure 27: The code for Part 3.

The number of lines needed for 100 telephones is 4950 with 1045 additional lines needed for 10 more telephones.

Figure 28: The output for Part 3.