Lab #1a

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ELEC2850 Microcontrollers Using C Programming

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1 Problem Statement

Create a program that will calculate the area of any tringle 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

Algorithm 1 Triangle Calculation

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

3 Flowchart

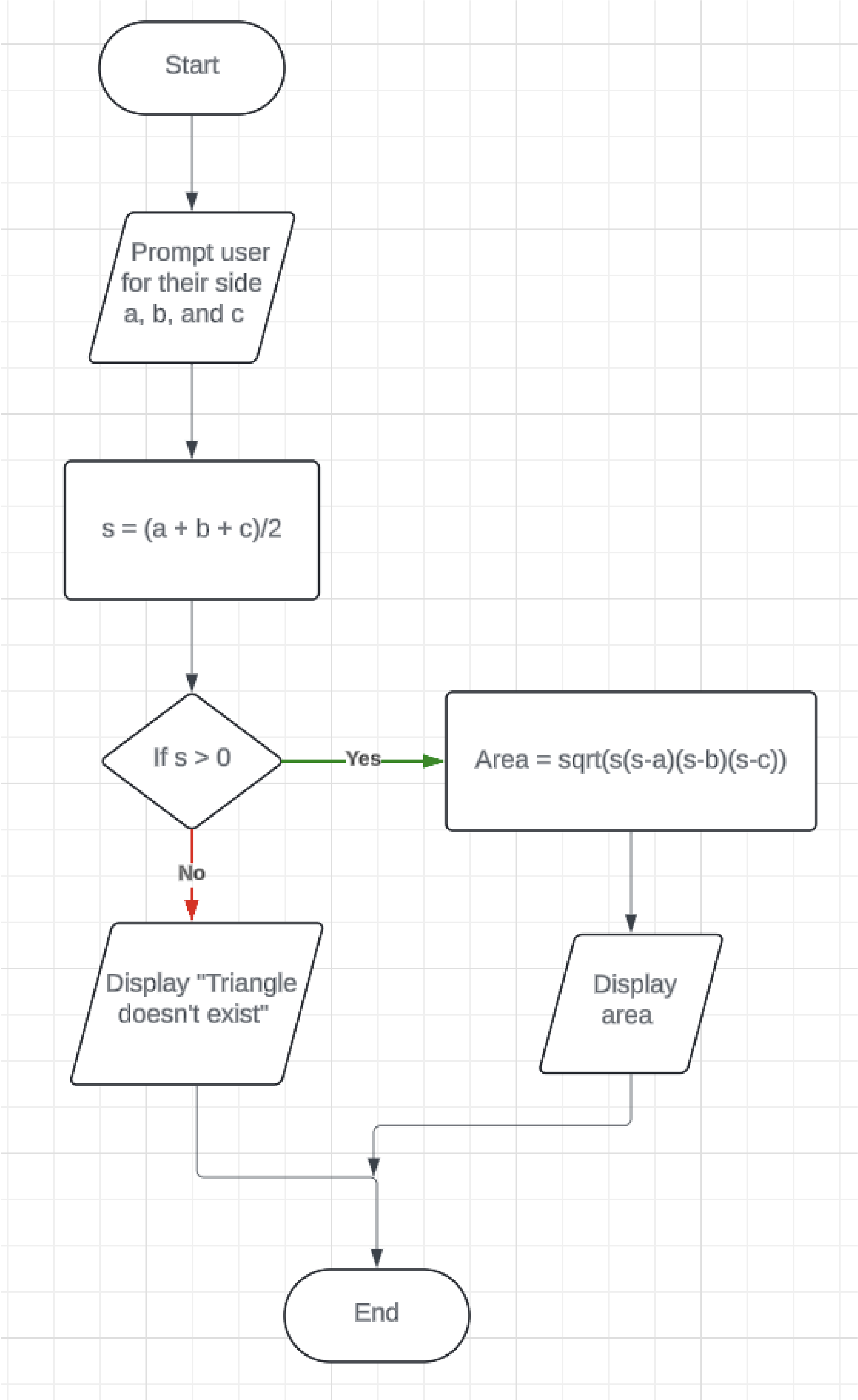

Start
Prompt user for their side a, b, and c
s = (a + b + c)/2
If s > 0
Yes
Area = sqrt(s(s-a)(s-b)(s-c))
No
Display "Triangle doesn't exist"
Display area
End

Figure 1: Flowchart for the program.

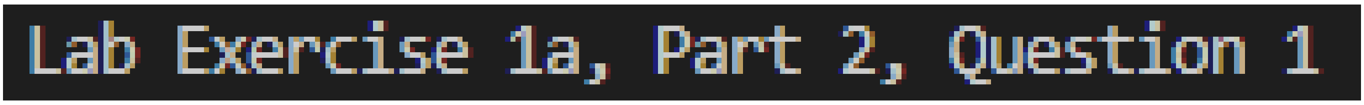
4 Part 2

4.1 Question 1

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

```c
// Lab Exercise 1a, Part 2, Question 1
#include <stdio.h>

int main()
{
  printf(”Lab Exercise 1a, Part 2, Question 1\n”);

  return 0;
}
```

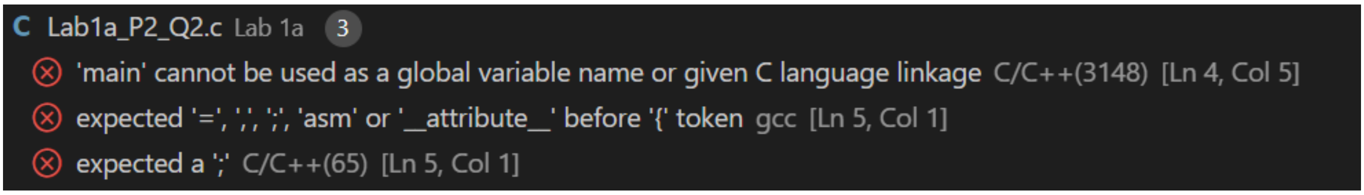
Figure 2: The code for question 1.



```
Lab Exercise 1a, Part 2, Question 1
```

Figure 3: Output of Q1.

4.2 Question 2



Lab1a_P2_Q2.c Lab 1a 3

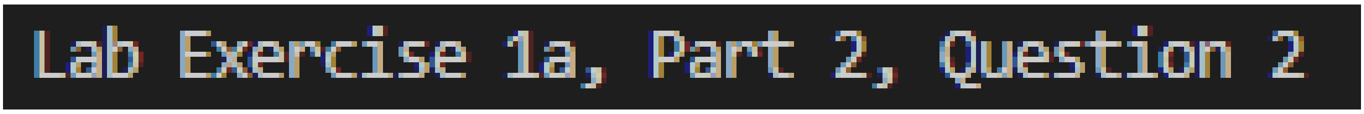
```
ⓧ 'main' cannot be used as a global variable name or given C language linkage C/C++(3148) [Ln 4, Col 5]
ⓧ expected '=', ',', ';', 'asm' or '__attribute__' before '{' token gcc [Ln 5, Col 1]
ⓧ expected a ';' C/C++(65) [Ln 5, Col 1]
```

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.

```c
//Lab Exercise 1a, Part 2, Question 2
#include<stdio.h>

int main()
{
  printf(”Lab Exercise 1a, Part 2, Question 2\n”);

  return 0;
}
```

Figure 5: The code for question 2.



```
Lab Exercise 1a, Part 2, Question 2
```

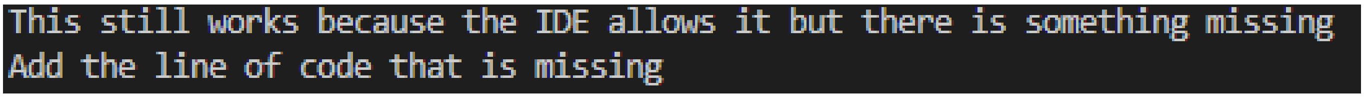
Figure 6: Output of Q2.

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.

```c
// Lab Exercise 1a, Part 2, Question 3
#include <stdio.h>

int main()
{
  printf(”This still works because the IDE allows it but there is something missing\n”);
  printf(”Add the line of code that is missing\n”);

  return 0;
}
```

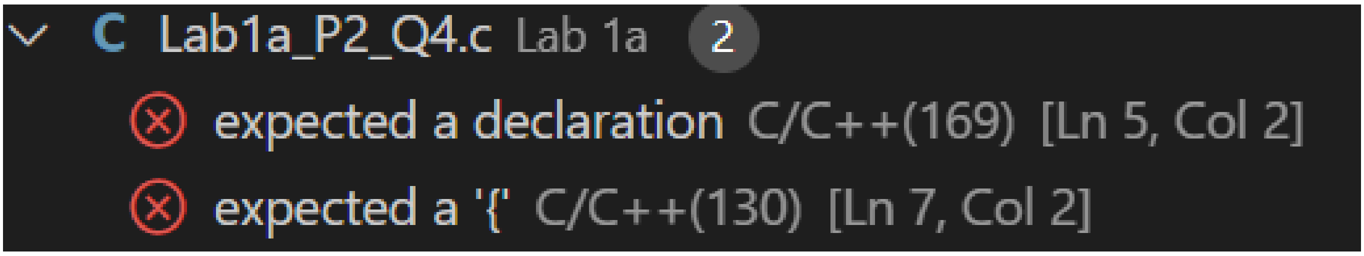
Figure 7: The code for question 3.



```
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



expected a declaration C/C++(169) [Ln 5, Col 2]

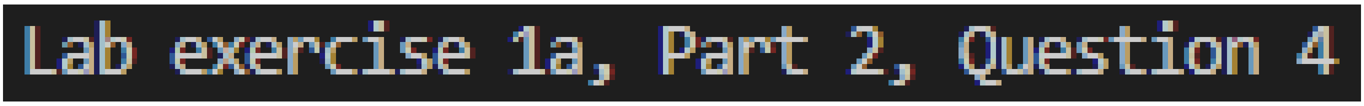
expected a '{' C/C++(130) [Ln 7, Col 2]

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

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

```c
// Lab Exercise 1a, Part 2, Question 4
#include <stdio.h>

int main()
{
  printf(”Lab exercise 1a, Part 2, Question 4\n”);

  return 0;
}
```

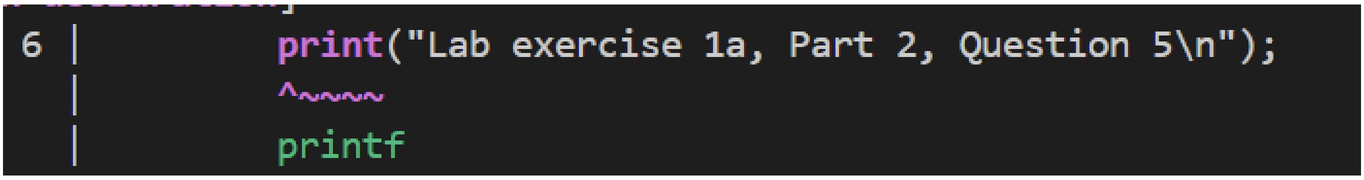
Figure 10: The code for question 4.



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

Figure 11: Output of Q4.

4.5 Question 5



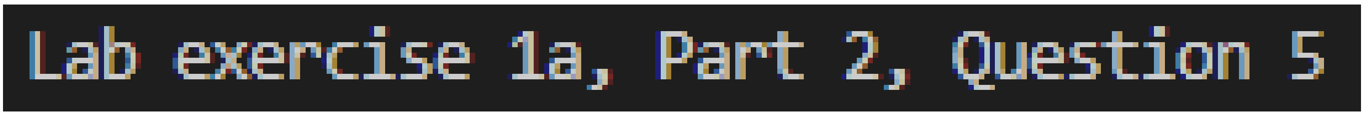
```
6 |         print("Lab exercise 1a, Part 2, Question 5\n");
  |         ^~~~~
  |         printf
```

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.

```c
// Lab Exercise 1a, Part 2, Question 5
#include <stdio.h>

int main()
{
  printf(”Lab exercise 1a, Part 2, Question 5\n”);

  return 0;
}
```

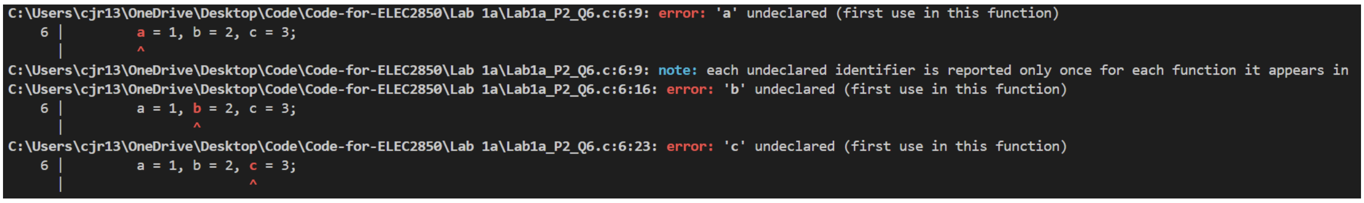
Figure 13: The code for question 5.



```
Lab exercise 1a, Part 2, Question 5
```

Figure 14: Output of Q5.

4.6 Question 6



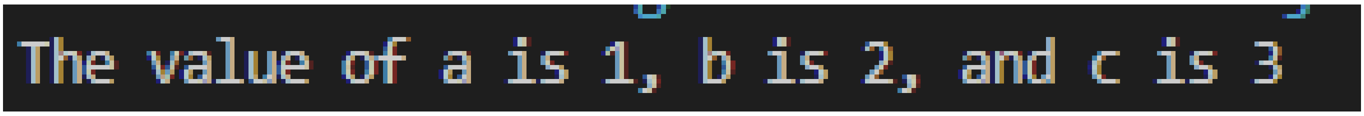
```
C:\Users\cjr13\OneDrive\Desktop\Code\Code-for-ELEC2850\Lab 1a\Lab1a_P2_Q6.c:6:9: error: 'a' undeclared (first use in this function)
    6 |         a = 1, b = 2, c = 3;
      |         ^
C:\Users\cjr13\OneDrive\Desktop\Code\Code-for-ELEC2850\Lab 1a\Lab1a_P2_Q6.c:6:9: note: each undeclared identifier is reported only once for each function it appears in
C:\Users\cjr13\OneDrive\Desktop\Code\Code-for-ELEC2850\Lab 1a\Lab1a_P2_Q6.c:6:16: error: 'b' undeclared (first use in this function)
    6 |         a = 1, b = 2, c = 3;
      |                ^
C:\Users\cjr13\OneDrive\Desktop\Code\Code-for-ELEC2850\Lab 1a\Lab1a_P2_Q6.c:6:23: error: 'c' undeclared (first use in this function)
    6 |         a = 1, b = 2, c = 3;
      |                       ^
```

Figure 15: Error message when compiling Q6.c

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

```c
// Lab Exercise 1a, Part 2, Question 6
#include <stdio.h>

int main()
{
  int a = 1, b = 2, c = 3;

  printf(”The value of a is %d, b is %d, and c is %d\n”, a, b, c);

  return 0;
}
```

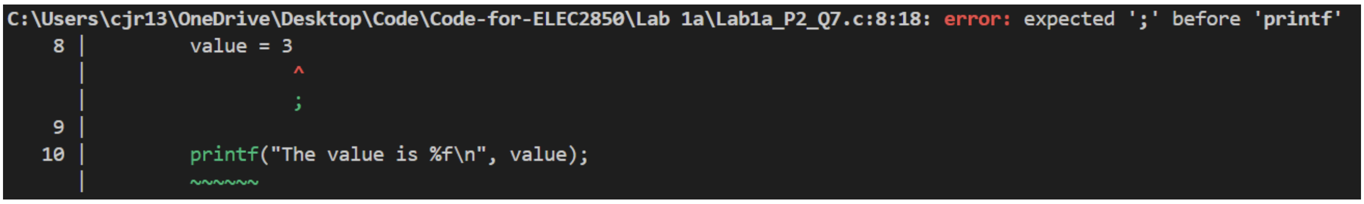
Figure 16: The code for question 6.



```
The value of a is 1, b is 2, and c is 3
```

Figure 17: Output of Q6.

4.7 Question 7



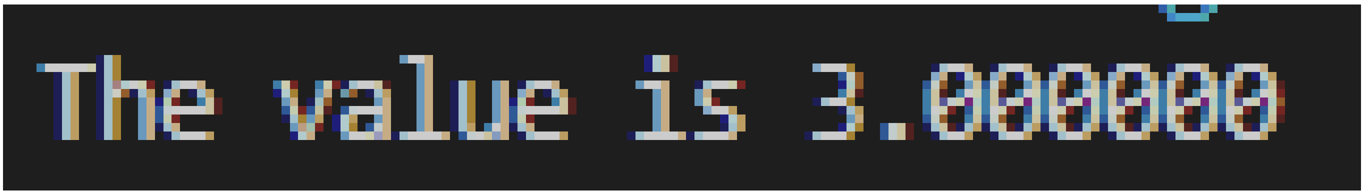
```
C:\Users\cjr13\OneDrive\Desktop\Code\Code-for-ELEC2850\Lab 1a\Lab1a_P2_Q7.c:8:18: error: expected ';' before 'printf'
    8 |         value = 3
      |                  ^
      |                  ;
    9 |
   10 |         printf("The value is %f\n", value);
      |         ~~~~~~
```

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.

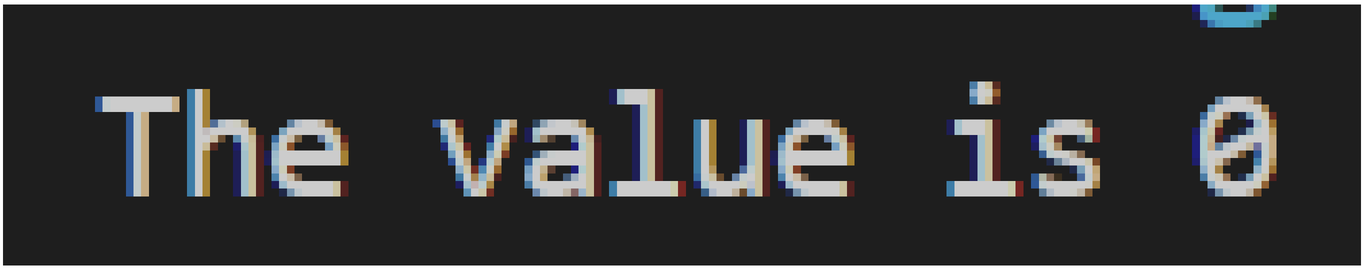


```
The value is 3.000000
```

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.

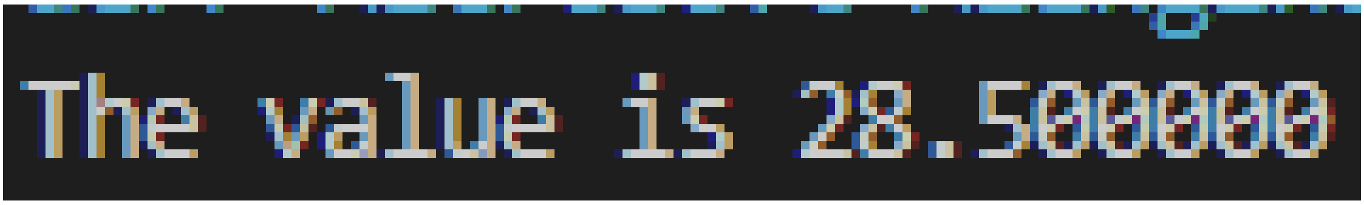


```
The value is 0
```

Figure 21: The output for Q8.

```c
// Lab Exercise 1a, Part 2, Question 8
#include <stdio.h>

int main()
{
  float value;

  value = 28.50;

  printf(”The value is %f\n”, value);

  return 0;
}
```

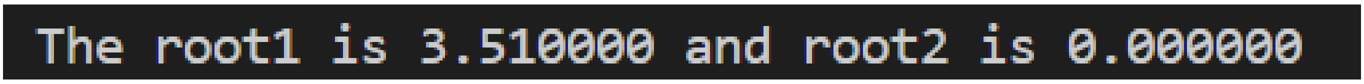
Figure 22: The code for question 8.



```
The value is 28.500000
```

Figure 23: Output of Q8.

4.9 Question 9



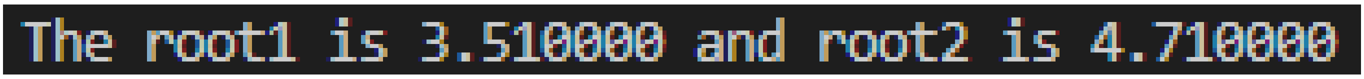
```
The root1 is 3.510000 and root2 is 0.000000
```

Figure 24: The output for Q9.

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

```c
//Lab Exercise 1a, Part 2, Question 9
#include<stdio.h>

int main()
{
  float root1 = 3.51, root2 = 4.71;

  printf(”The root1 is %f and root2 is %f\n”, root1, root2);

  return 0;
}
```

Figure 25: The code for question 9.



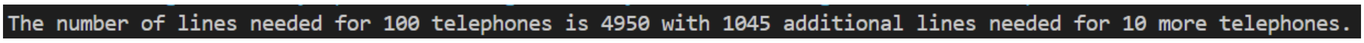
```
The root1 is 3.510000 and root2 is 4.710000
```

Figure 26: Output of Q9.

5 Part 3

```c
#include <stdio.h>

void main()
{
    int phones = 100;                                                        // Start with 100 phones
    int addedPhones = 10;                                                    // add ten more phones
    int lines = (phones * (phones - 1)) / 2;                                 // Calculate the number of lines needed for 100 phones
    int linesNeededFuture = ((phones + addedPhones) * (phones + addedPhones - 1)) / 2; // Calculate the number of lines needed for 100 phones + addedPhones
    int linesNeeded = linesNeededFuture - lines;                             // Calculate the additional lines needed
    printf("The number of lines needed for %d telephones is %d with %d additional lines needed for %d more telephones.",
           phones, lines, linesNeeded, addedPhones); // Print the number of lines needed for 100 phones and the additional lines needed for more phones
}
```

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.