



Name: _____

ISTE100 – Computational Problem Solving in the Network Domain I

Lab 4: Calculations, Input Validation and Output Formatting

Preliminary Setup

- 1) From myCourses, download **Lab04.zip** archive.
- 2) From **Lab04.zip** archive extract the project folder **Lab04Ex01**.

Exercise 1 – More selection for validation. (3 points)

Must be completed during the lab period.

- 1) Open the **Lab04Ex01** folder and open the **Lab04Ex01** project in Code::Blocks.
- 2) If the **Lab04Ex01.cpp** file isn't open, open it. NOTE: Open the file by clicking on the file name in **sources**.
- 3) What you have in front of you is a program that calculates the perimeter and the area of a triangle. The code provided for you only implements the input and the output portion of the program. Hence, you will find the code to prompt the user for the length of each of the three sides and the code to output the perimeter and the area of the triangle. You will also find the variables declared to store the lengths of the sides as well as the area and the perimeter. Your task is to complete the program as follows:
 - a) Add the validation to code, which prompts the user to enter the value for the side of the triangle, to ensure that only positive non-zero values are entered. Add your code under the comments

```
/**
/** Validate Side A
/**
/**
/** Validate Side B
/**
/**
/** Validate Side C
/**
```

to validate the input for the respective side. Figure 1 and Figure 2 illustrate side A input being validated. **Provide such validation for all three sides.**

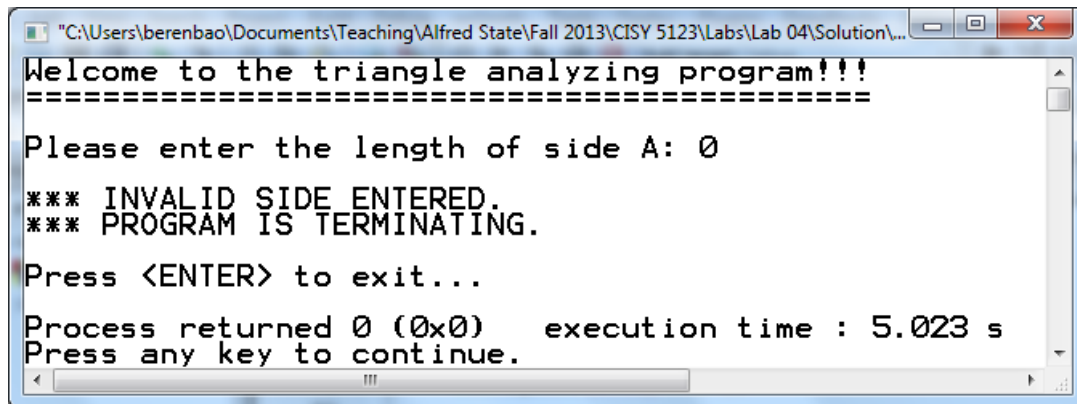


Figure 1 - Zero input is provided for side A.

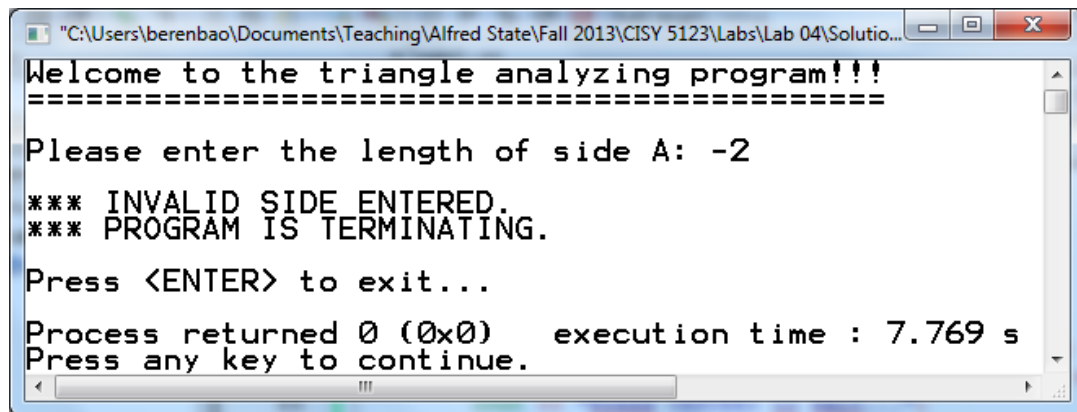


Figure 2 - Negative input is provided for side A.

b) Under the comment

```

//***
//*** Calculate the perimeter of the triangle
//***
  
```

add the code to calculate the perimeter of the triangle. Remember the formula, $P = A + B + C$?

c) Under the comment

```

//***
//*** Calculate the area of the triangle using the formula attributed to
//*** Heron of Alexandria
//***
  
```

add the code to calculate the area of the triangle using the formula attributed to Heron of Alexandria:

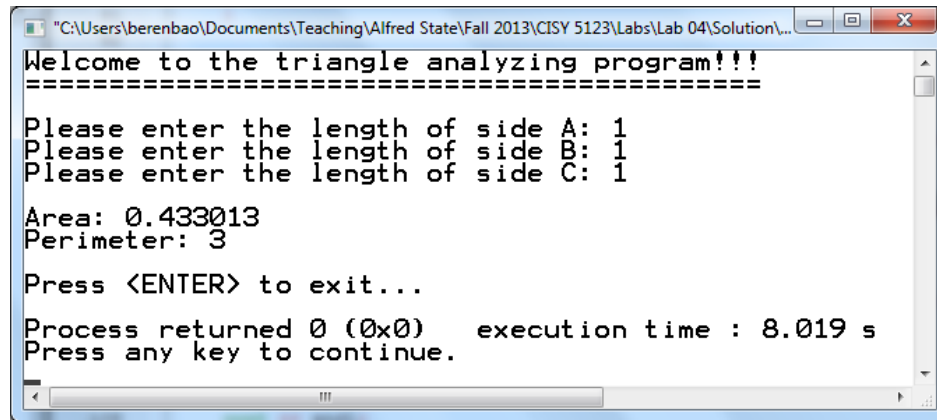
$$\text{Area} = \sqrt{s(s-a)(s-b)(s-c)}$$

Where

$$s = \frac{A + B + C}{2} \text{ or } s = \frac{\text{Perimeter}}{2}$$

You will need to declare a variable for s , and you can use already calculated perimeter value to calculate the value of s .

- d) Compile and run the program. Be sure to test it to ensure that validation of the input for all three sides works correctly.



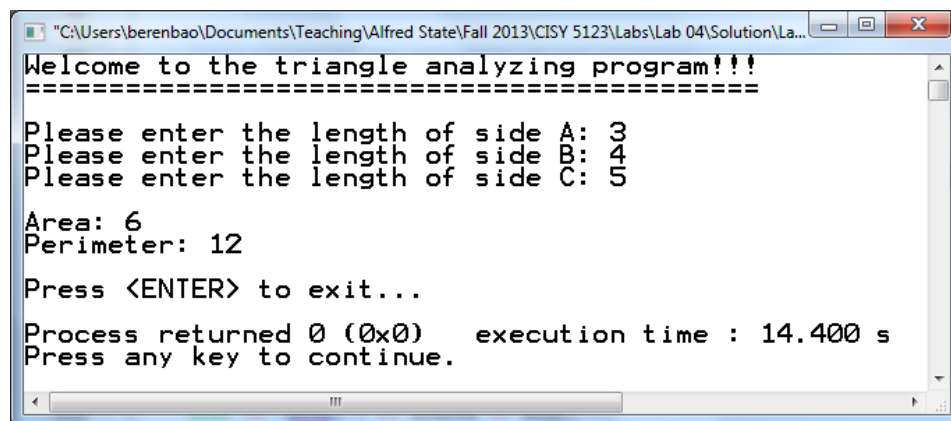
```
"C:\Users\berenbao\Documents\Teaching\Alfred State\Fall 2013\CISY 5123\Labs\Lab 04\Solution\La...
Welcome to the triangle analyzing program!!!
=====
Please enter the length of side A: 1
Please enter the length of side B: 1
Please enter the length of side C: 1

Area: 0.433013
Perimeter: 3

Press <ENTER> to exit...

Process returned 0 (0x0)   execution time : 8.019 s
Press any key to continue.
```

Figure 3 - Testing for sides 1, 1, 1



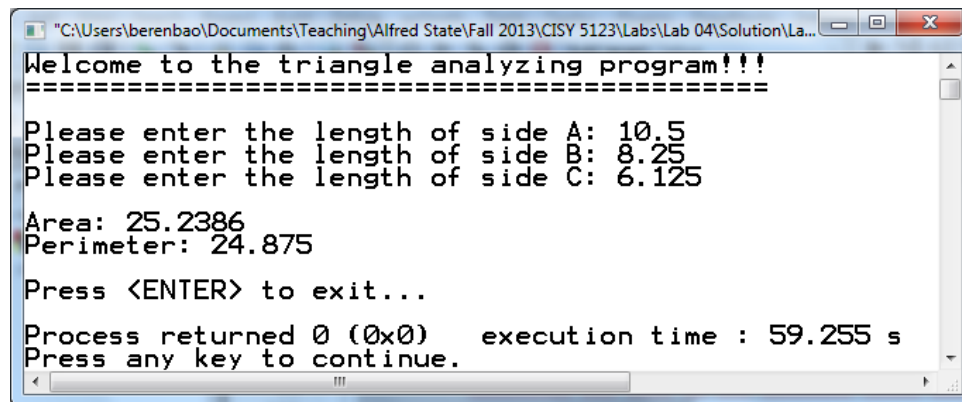
```
"C:\Users\berenbao\Documents\Teaching\Alfred State\Fall 2013\CISY 5123\Labs\Lab 04\Solution\La...
Welcome to the triangle analyzing program!!!
=====
Please enter the length of side A: 3
Please enter the length of side B: 4
Please enter the length of side C: 5

Area: 6
Perimeter: 12

Press <ENTER> to exit...

Process returned 0 (0x0)   execution time : 14.400 s
Press any key to continue.
```

Figure 4 - Testing for sides 3, 4, 5



```
"C:\Users\berenbao\Documents\Teaching\Alfred State\Fall 2013\CISY 5123\Labs\Lab 04\Solution\La...
Welcome to the triangle analyzing program!!!
=====
Please enter the length of side A: 10.5
Please enter the length of side B: 8.25
Please enter the length of side C: 6.125

Area: 25.2386
Perimeter: 24.875

Press <ENTER> to exit...

Process returned 0 (0x0)   execution time : 59.255 s
Press any key to continue.
```

Figure 5 - Testing for sides 10.5, 8.25, 6.125

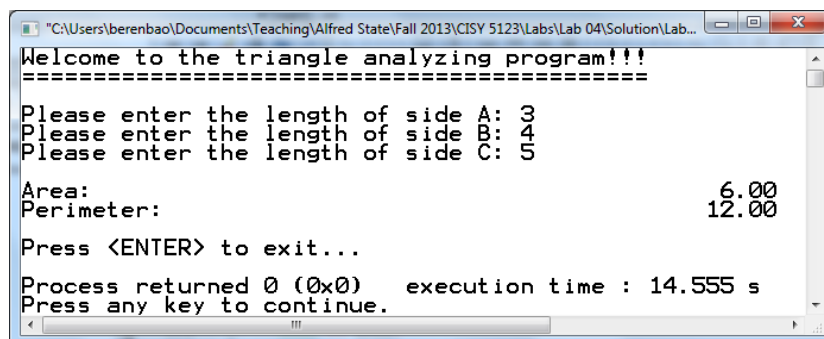
- e) Be sure your output matches Figure 3, Figure 4, and Figure 5.

Signature: _____ Date: _____

Have your instructor sign here when Exercise 1 works correctly.

Exercise 2 – Pretty-up the output a bit. (3 points)**Must be completed during the lab period**

- 1) Close the **Lab04Ex01** project.
- 2) Change current folder to one level above the **Lab04Ex01** folder and copy the **Lab04Ex01** folder. Name your copy **Lab04Ex02**.
- 3) Open the **Lab04Ex02** folder and open the project to add the output formatting to the project.
- 4) Be sure to **#include** the header necessary to perform **IO manipulations**. If you don't remember the name of the header, please refer to the lecture slides/notes.
- 5) Locate the section of code where the results are being output. To the code add the necessary I/O manipulators to achieve the following formatting results:
 - a) Use fixed floating point display with precision of 2.
 - b) The headings **Area** and **Perimeter** should be displayed **left-justified** and take up 45 columns.
 - c) The numerical values **area** and **perimeter** should be **right-justified** and take up 8 columns.
- 6) Compile and run your program. Your output should match that shown in Figure 6 and Figure 7.



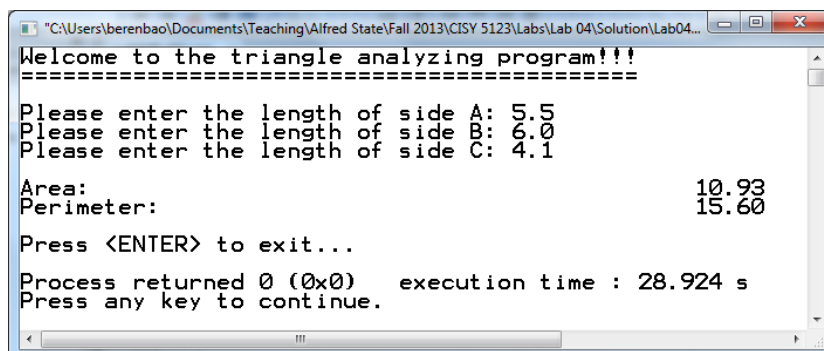
```

Welcome to the triangle analyzing program!!!
=====
Please enter the length of side A: 3
Please enter the length of side B: 4
Please enter the length of side C: 5

Area:                                6.00
Perimeter:                          12.00

Press <ENTER> to exit...
Process returned 0 (0x0)   execution time : 14.555 s
Press any key to continue.

```

Figure 6 - Formatted output using whole numbers.

```

Welcome to the triangle analyzing program!!!
=====
Please enter the length of side A: 5.5
Please enter the length of side B: 6.0
Please enter the length of side C: 4.1

Area:                                10.93
Perimeter:                          15.60

Press <ENTER> to exit...
Process returned 0 (0x0)   execution time : 28.924 s
Press any key to continue.

```

Figure 7 - Formatted output using fractional numbers.

Signature: _____ Date: _____

Have your instructor sign here when your program works as specified.

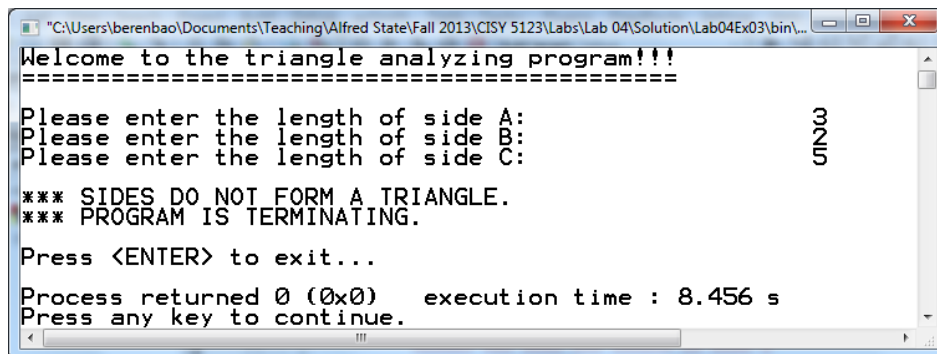
Exercise 3 – One final bit of validation. (4 points)**Must be completed during the lab period**

Your code now validates user's input for the lengths of sides. For example, it is impossible to have a triangle with the length of any of the sides equal to 0 or being a negative number. Your code will now catch that. However, it is still possible to provide input such that all three sides are positive, but will not form a triangle. For example, try to draw a triangle with sides of lengths 3", 2", and 5". The validation for such condition rule is simple:

The sum of any two sides must be greater than the length of the remaining side.

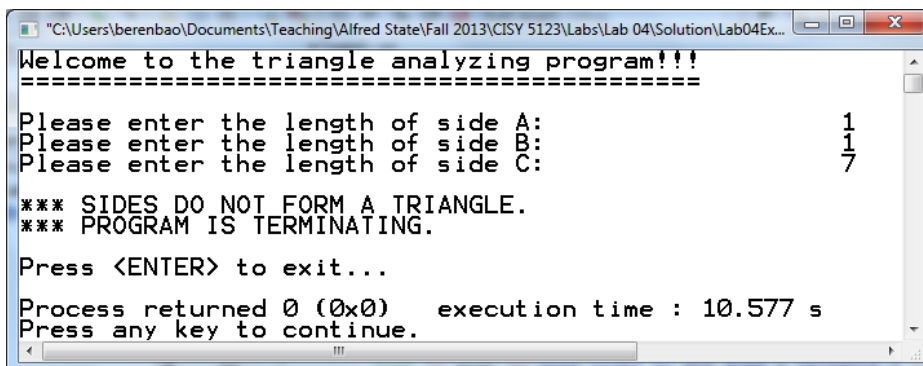
Thus, the triangle is invalid when: $(A + B) \leq C$ OR $(A + C) \leq B$ OR $(B + C) \leq A$.

- 1) Close the **Lab04Ex02** project.
- 2) Change to one level above the **Lab04Ex02** folder and copy the **Lab04Ex02** folder. Name your copy **Lab04Ex03**.
- 3) To the location in the code, after all triangle sides have been input and validated, add validation code to determine whether the three sides entered form a triangle. If the three sides provided do not form a triangle, the program should display an error message and terminate, as shown in Figure 8 and Figure 9.



```
"C:\Users\berenbao\Documents\Teaching\Alfred State\Fall 2013\CISY 5123\Labs\Lab 04\Solution\Lab04Ex03\bin\...
Welcome to the triangle analyzing program!!!
=====
Please enter the length of side A:
Please enter the length of side B:
Please enter the length of side C:
*** SIDES DO NOT FORM A TRIANGLE.
*** PROGRAM IS TERMINATING.
Press <ENTER> to exit...
Process returned 0 (0x0) execution time : 8.456 s
Press any key to continue.
```

Figure 8 - Sides don't form a triangle.



```
"C:\Users\berenbao\Documents\Teaching\Alfred State\Fall 2013\CISY 5123\Labs\Lab 04\Solution\Lab04Ex...
Welcome to the triangle analyzing program!!!
=====
Please enter the length of side A:
Please enter the length of side B:
Please enter the length of side C:
*** SIDES DO NOT FORM A TRIANGLE.
*** PROGRAM IS TERMINATING.
Press <ENTER> to exit...
Process returned 0 (0x0) execution time : 10.577 s
Press any key to continue.
```

Figure 9 - Another example of sides not forming a triangle.

Signature: _____ Date: _____
Have your instructor sign here when Exercise 3 works correctly.