ASSIGNMENT 1

GENE-121-001

Fall 2017

CONTENTS

INTRODUCTION

This assignment is to be completed individually.

In this assignment, you will:

- Debug, modify, and compile a simple C++ program.
- Write a simple C++ program from scratch.
- Use the standard GENE 121 submission format to ensure academic and professional integrity.

ENVIRONMENT SETUP

Your "development environment" refers to the tools (typically software) that you use to create, run, and test your code. In GENE 121, we will be using the Orwell Dev C++ integrated development environment (IDE) running on Microsoft Windows.

SETTING UP A CODE REPOSITORY

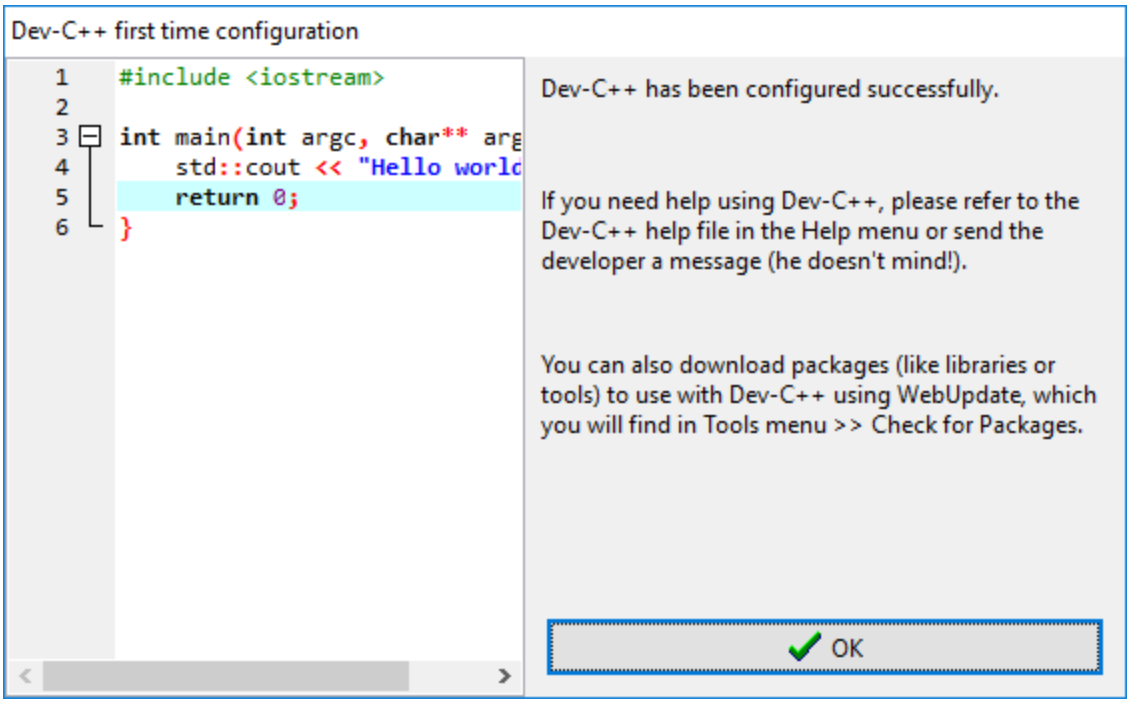
Before starting to code, you should have a single storage location where all your code will be stored. This will prevent accidentally using old versions of code. In addition, this prevents accidental loss of code as the entire code repository can be backed up easily.

The recommended location for this course is on your UW NEXUS N drive. This can be accessed by opening up **"This PC"** (on Windows 10) or **"My Computer"** (on Windows 7/8) and looked for the **(N:)** drive. It is recommended that you create yourself a folder (e.g. GENE_121) on your N drive for storing your code. Don't put the folder in "**My Documents**" or have any spaces in the name as this may cause problems for the compiler.

RUNNING DEV C++

From the Start Menu in Windows, select the **"Bloodshed Dev C++"** folder, and run **"Dev-C++"**.

If this is the first time you have run Dev-C++ on the computer, or your previous settings were not saved, you will be asked to complete a **"first time configuration".** You can accept the defaults by simply clicking the **"Next"** button three times.



QUESTION 1 – HELLO WORLD

In this question, you will demonstrate that you can download sample code from Learn, compile it, and submit the output for evaluation. Submitting the output along with your code is a key part of the evaluation process.

DOWNLOAD THE CODE

From the Assignment 1 folder on the GENE 121 Learn course, download the file **hello.cpp**.

OPEN THE CODE FILE

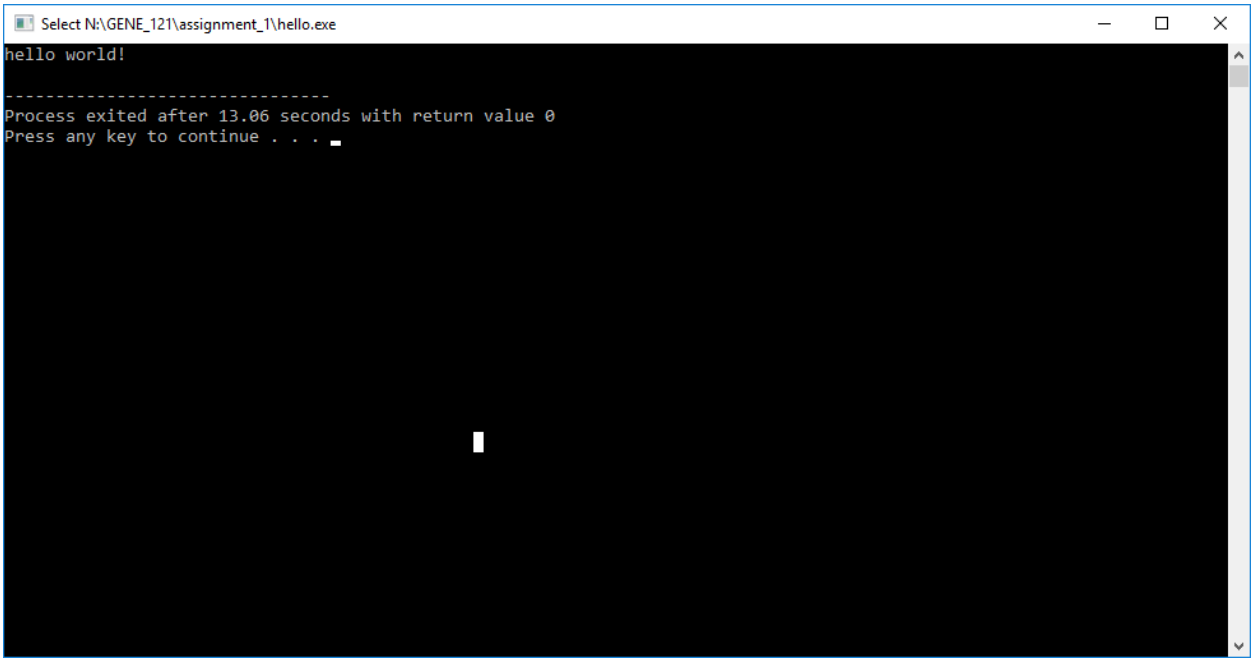
Open the **hello.cpp** code file from Dev C++.

COMPILE THE CODE

From the menu select **"Execute"**, then **"Compile"**. You will see the results from the compilation at the bottom of the screen in the **"Compile Log"**.

RUN THE PROGRAM

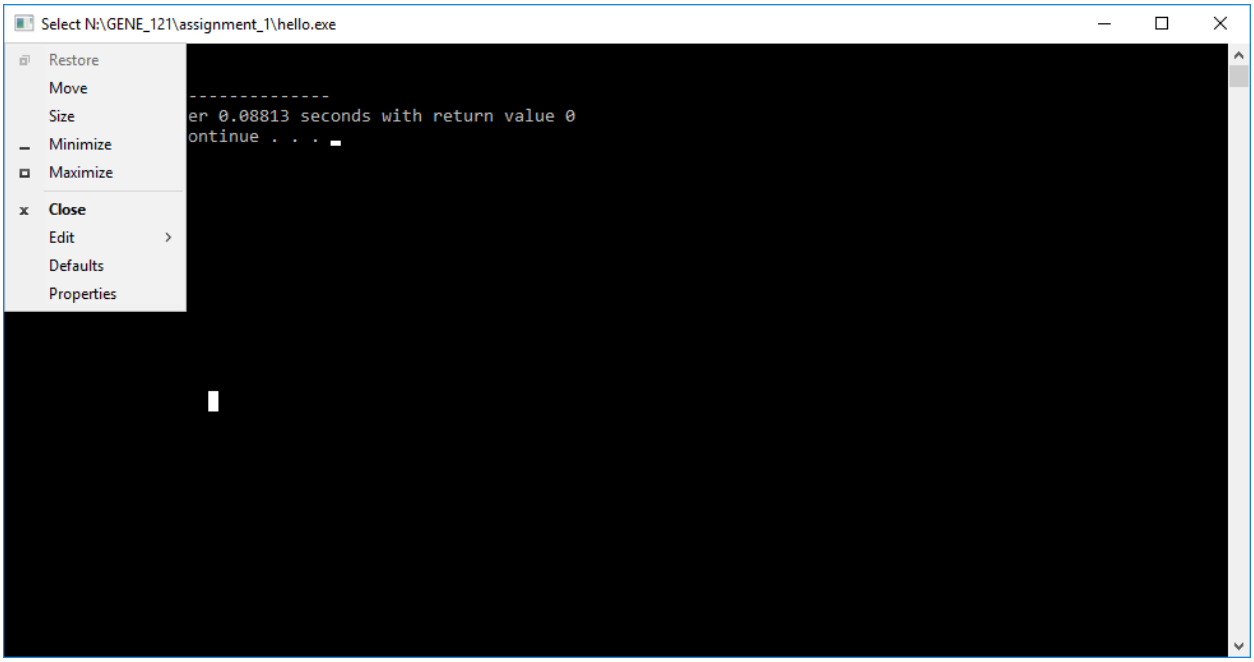
From the menu select **"Execute"**, then **"Run"**. The program should run in a separate window and pause when completed. You have now successfully run a program that was written in C++ and compiled to run in Windows.



COPY PROGRAM OUTPUT

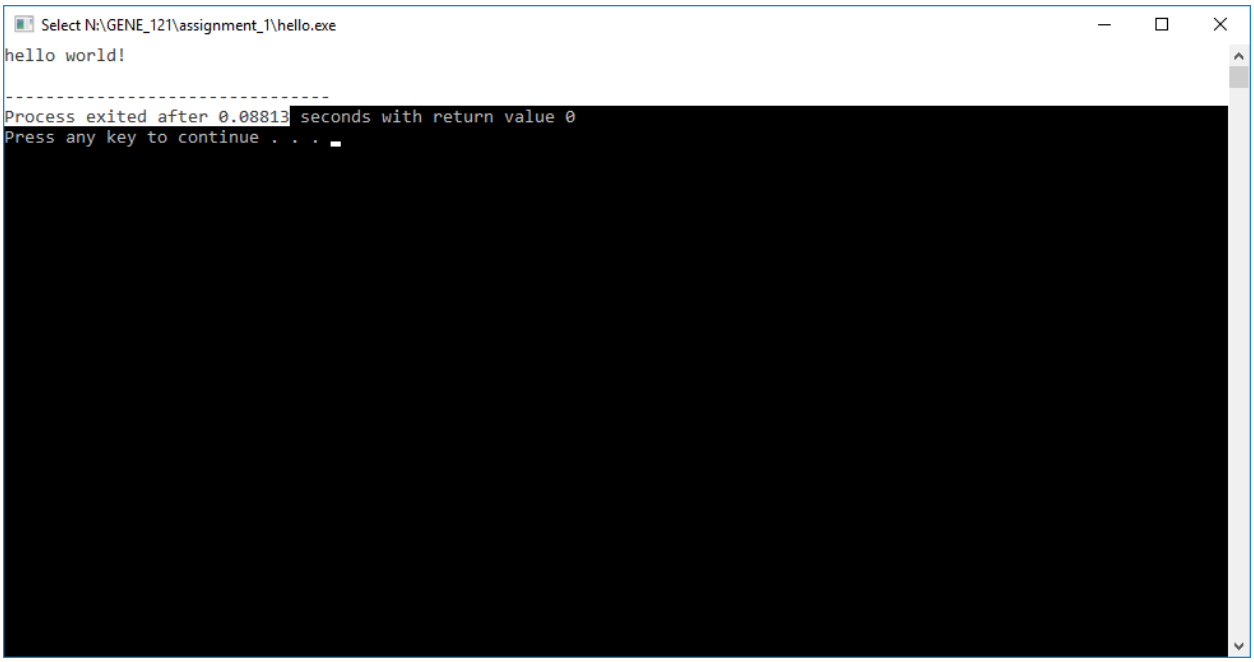
When you are satisfied with your program output, you will need to submit a copy of the output along with your code, for marking. This serves as evidence that you successfully ran your code, and provides evidence of your program's actual behavior.

In order to copy your program output, click the top left corner of the output window. This will bring down a drop-down menu.

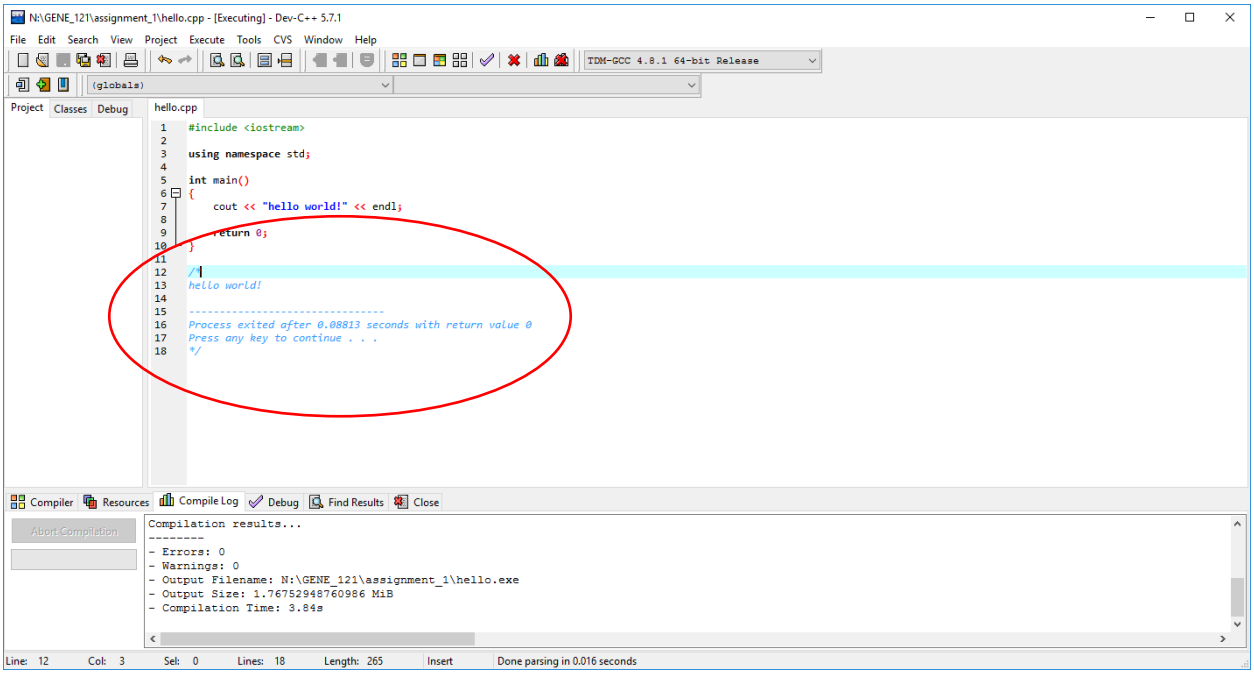


Select **"Edit"** and then **"Mark"**.

Using your mouse, click and drag a window around the text you would like to copy.



Once you are satisfied with your selection, press the **"Enter"** key. Paste the selection as a multi-line comment at the bottom of the code.



QUESTION 2 – DEBUGGING

In this exercise, you will be given some code containing errors (bugs). Your task is to modify (fix) the code so that it behaves in the intended fashion.

DOWNLOAD AND OPEN THE CODE

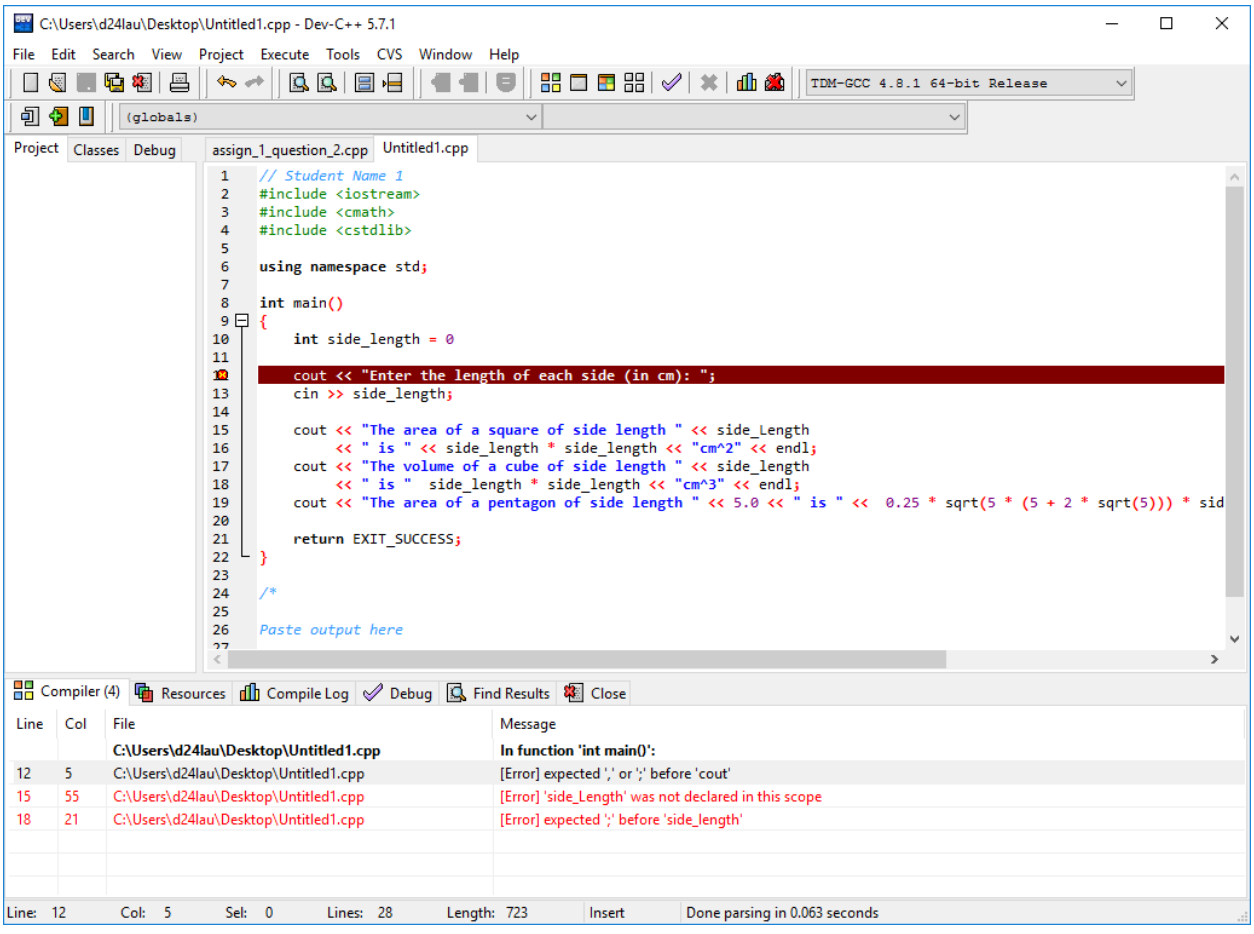
From the Assignment 1 folder on the GENE 121 Learn course, download the file **polygon.cpp** and open it in Dev C++.

INTERPRET THE CODE

Attempt to understand the intended behavior of the code by reading the code.

You may also attempt to compile the code. The error messages from the compiler may assist you with identifying trouble spots in the code.

The figure below shows error messages from the compiler, with locations (line number and column number) and descriptions of the errors. Note that the descriptions are the compiler's best guess at the error. You will need to use both the error messages and your own understanding of the code to figure out what the real problem is.



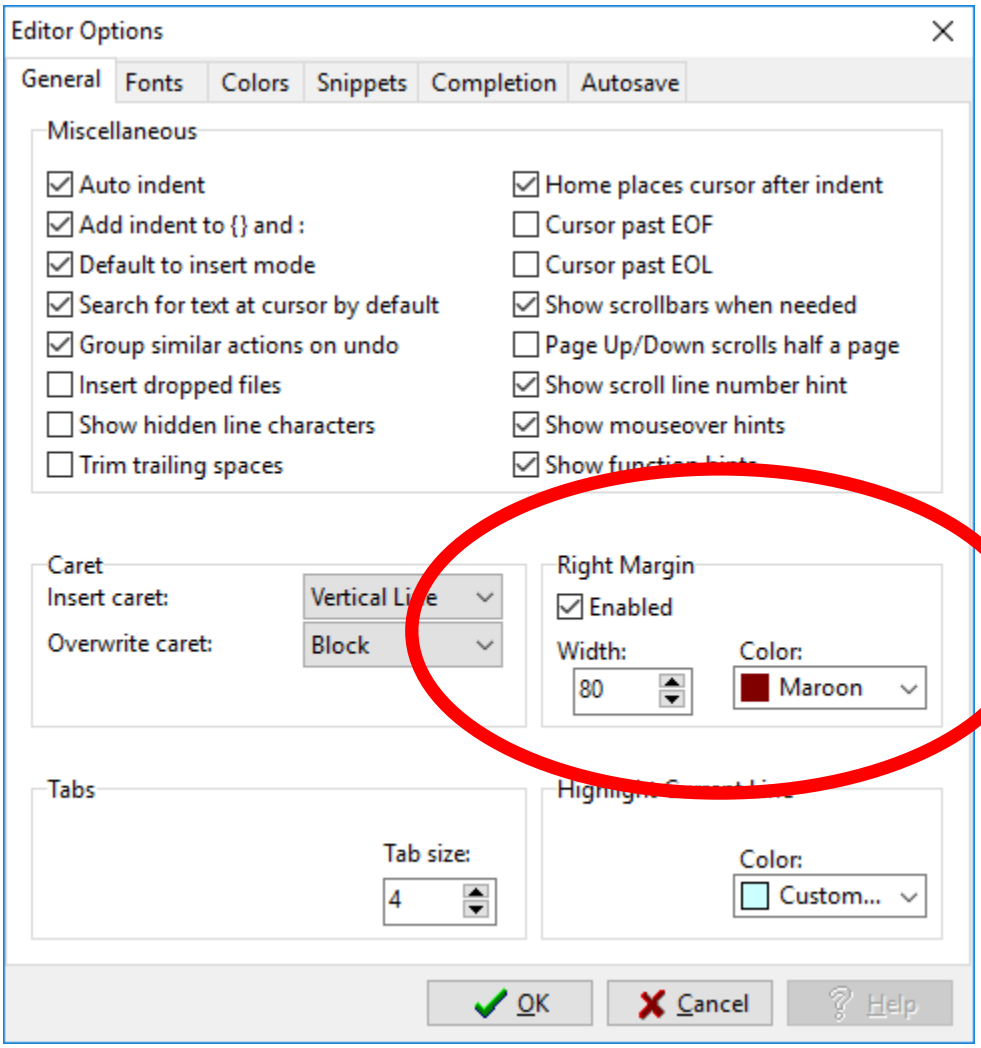
MODIFY THE CODE

For each bug that you identify, make a modification to the code that you believe will correct its behavior.

Some bugs in this code are syntax errors, where the code instructions don't match those required by the C++ language. Other bugs in this code are semantic errors, where the code will run but it does not do what the author intended originally.

Finally, there is a style bug. Ensure that all code lines are a maximum of 80 characters long. This is to ensure no code is cut off when printed.

In Dev C++ you can enable a vertical margin at width of 80 characters that will quickly show whether a line of code is too long or not. From the menu, select **"Tools"** -> **"Editor Options"**. In the **"Right Margin"** section, select **"Enabled",** set the **"Width:"** to 80 and select a dark color from the **"Color:"** drop-down.



TEST THE CODE

Compile, run, and test the code to see if it behaves as intended. Test the program with an input of 8 cm and copy the output to the bottom of your code for submission.

You may need to repeat the cycle of modification, compiling, and testing the code in order to identify and resolve all seven of the bugs. You are expected to find and correct all seven bugs.

QUESTION 3 – WRITE YOUR OWN CODE

In this question, you are asked to write your own program from scratch for the first time. If you are struggling to get started, write out the steps you think the program needs to do in plain English and then talk to a TA.

The Mechatronics class of 2022 is holding a pizza party. Write a program that will help the class representatives calculate the area of pizza that each student will consume. The user will input the number of pizzas and the number of students attending. The program will then output the surface area of pizza consumed by each student. Each pizza has a radius of 17cm. The output needs to be accurate to a minimum of 0.1 cm^2.

The program is expected to prompt the user for input, before accepting input of the integers.

Besides the code, submit the output for the following test cases:

- 22 pizzas, 11 students
- 5 pizzas, 9 students
- 6 pizzas, 0 students

If you assume all students are eating the same amount of pizza, state this as an assumption as a comment in your code.

QUESTION 4

Write a program that receives the side lengths of a triangle, and then calculates the three contained angles. You should calculate the angles using both the Law of Cosines and the Law of Sines. Your program should then output the angles as well as the area of the triangle. Angles should be output in degrees.

You program should also check to see if the side lengths entered form a valid triangle. If an invalid triangle is entered, the program should end with an appropriate error message. You may choose to assume that the longest side length is always entered last.

Submit your output for the test cases (3, 4, 5) and (13, 13, 24.021).

As a comment at the bottom of your code, explain any differences between the results from the Law of Cosines and the Law of Sines.

Sample program output:

```
Enter the three side lengths of a triangle:
4.1 4.1 4.1

Angles according to Law of Cosines: 60 60 60
Angles according to Law of Sines: 60 60 60
Area: 7.27894
```

Useful formulae:

Law of Cosines

$$c^2 = a^2 + b^2 - 2ab\cos c$$

Law of Sines

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

Area of a triangle

$$area = \sqrt{s(s-a)(s-b)(s-c)}, where\ s = perimeter/2$$

SUBMITTING THE ASSIGNMENT

HEADER PAGE

Download the file **"header.txt"** from Learn (Assignment 1 folder). Open the header page in Dev C++ and fill in the empty fields at the top of the page. In the given section, acknowledge any assistance received.

Read the declaration, print the header page, and sign the page when you are confident you understand the declaration. Any assignments without a signed header page will be returned ungraded and may be subject to a late penalty upon re-submission.

PRINTING

You are encouraged to have your name as a comment at the top of each code file so that when it prints it will not be confused with another student's code.

When printing on a University printer, you will be charged $0.05 per page. This amount is deducted from a printing account that each student is assigned when first enrolled at the University. Your account begins with 50 free pages of printing, but after that you will be required to deposit funds to continue printing.

You can access your print account at http://xas.uwaterloo.ca.

There are two printers each in the WEEF Lab (E2-1310) and the Multimedia Lab (CPH-1346):

WEEF Lab (E2-1310)	**Multimedia Lab (CPH-1346)**
WEEFLab_Front	MMLab_Front
WEEFLab_Back	MMLab_Back

SUBMISSION PACKAGE

The entire (stapled) package is to be submitted in the blue drop box in the E2 Atrium. There is a labeled slot for each GENE 121 section.

COMPLETE THE ACADEMIC INTEGRITY QUIZ

You are reminded that you are required to complete the Academic Integrity Quiz, which can be found on Learn.

COMPLETE THE MTE START OF TERM SURVEY

You are reminded that you are required to complete the MTE Start of Term Survey, which can be found on Learn.