CSci 1113: Introduction to C/C++
Programming for Scientists and Engineers
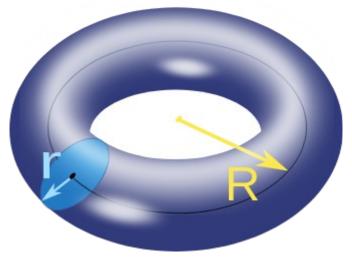Homework 0
Fall 2018

Due Date: Wednesday, September 19, 2018 before 11:00pm.

Instructions: This is an individual homework assignment. There is one problem worth
20 points. Solve the problem below by yourself (unlike the labs, where you work
collaboratively), and submit the solution as a C++ source code file. Here are a
few more important details:

1. Unlike the computer lab exercises, this **is not** a collaborative assignment. You must
design, implement, and test the solution to each problem on your own without the
assistance of anyone other than the course instructor or TAs. In addition, you may
not include solutions or portions of solutions obtained from any source other than
those provided in class: examples from the textbook, lectures, or code you and your
partner write to solve lab problems. Otherwise obtaining or providing solutions to
any homework problems for this class is considered academic misconduct. See the
"collaboration rules" file on the class website page for more details, and ask the instructor
if you have questions.

2. Because all homework assignments are submitted and tested electronically, the fol-
lowing are important:
     • You follow the naming conventions mentioned at the end of the problems.
     • You submit the correct file(s) through Moodle by the due deadline.
     • You follow the example input and output formats exactly given in each problem description.
     • **Regardless of how or where you develop your solutions, your programs compile
        and execute on cselabs computers running the Linux operating system.**

3. The problem descriptions will usually show at least one test case and the resulting
correct output. However, you should test your program on other test cases (that you
make up) as well. Making up good test cases is a valuable programming skill, and is
part of ensuring your code solution is correct.

Problem A: Torus (20 points)
Make a simple program that asks a user two radii (in the fashion shown below). These radii define a
torus ("doughnut"), where the first is the radius from the center to the center of the torus ('R' in the
picture below) and the second is the radius defining the thickness of the torus ('r' in the picture below).

Then display first the surface area and the volume in the format shown below. The relevant formulas are:

Surface Area: $4 \cdot \pi^2 \cdot R \cdot r$
Volume: $2 \cdot \pi^2 \cdot R \cdot r^2$

Note: we will use test cases to assist in grading the homework. Please ensure that you follow the format below to make the graders' lives easier. You can also assume we will only enter values where: 'r' < 'R'.

Example 1 (user input is underlined for clarity, underlined text in your program is not needed):
```
Large radius:
2
Small radius:
1.5
Surface Area:
118.435
Volume:
88.8264
```

Example 2 (user input is underlined for clarity, underlined text in your program is not needed):
```
Large radius:
22.5
Small radius:
2
Surface Area:
1776.53
Volume:
1776.53
```

Test your program using not only the example data above, but other cases as well. And revise your program until you are sure it is correct.

When you are done, name the source code file <username>_0A.cpp. Here you replace <username> with your U of M email address; for example, if your email address is smithx1234@umn.edu, your file should be named smithx1234_0A.cpp. Then submit your program using the HW 0 Problem A submission link in Moodle.

It is important that you follow the file naming conventions very carefully. For example, note your username should be all in lowercase, you should not include "@umn.edu", the file name should contain an underscore (not a dash), the 'A' in the "0A" part is upper case, the extension is .cpp, etc. Following rigorous naming conventions is something computer programmers often must do in "real life" programming, and so submitting your program with the correct name is part of doing this assignment correctly.