

# CS120 - Computer Science I

## Lab Assignment #2

### Spring 2014

The purpose of this assignment is to develop, compile, and execute a simple C++ program, starting from scratch.

Computers are often used for *solids modeling*. Basic shapes, called *primitives*, are created, intersected, added and subtracted to produce more complex shapes. The first calculations that are usually made in solids modeling programs are volume and surface area.

For this lab, you are to write a program that prompts the user for values of radius and height, and outputs the volume and surface area for the following solids:

- Right circular cylinder:

$$V = \pi r^2 h$$

$$S = 2\pi r(r + h)$$

- Right circular cone:

$$V = \frac{1}{3}\pi r^2 h$$

$$S = \pi r(r + \sqrt{r^2 + h^2})$$

- Sphere (does not use height)

$$V = \frac{4}{3}\pi r^3$$

$$S = 4\pi r^2$$

Use a value of 3.14159 for  $\pi$ .

In addition to volume and surface area, the *ratio* of the two is often of interest, since it provides a measure of the relative “efficiency” of the solid, i.e., how much volume can be enclosed by a certain amount of surface material. For instance, in the case of a pop can (a right circular cylinder), the ratio would give some indication of the amount of liquid that can be enclosed by a certain amount of aluminum sheet - the larger the number, the more “efficient” the can will be. For this assignment, also output the ratio of volume to surface area for each solid. You can choose the format for your outputs, but it should look reasonable.

Input your program, compile it, and try it on several test cases (i.e., several input values). Once you are sure that it works properly, use the `script` command to create an output file that includes a listing of your program, the compilation results (ie, the `g++` command), and a few separate executions of your program.