# Homework 1 - Volume Calculator

In this homework assignment, you will be writing a calculator for the volume of combine shapes and to understand console input/output, some basic data types, and basic arithmetic in C++.

Part I: Calculating Areas

1. Follow steps similar to In-Class2.

2. Include the following like in the exercise:

   ```
   #define _USE_MATH_DEFINES // for C++
   #include <cmath>
   ```
   And use the constant **M_PI** for π in your equations.

3. Prompt, read the data, and print output like in the example below. Use type **double** for all of the variables. You are calculating the volume of a tank shaped like a cone on top of a cylinder with ½ of a sphere on the bottom.
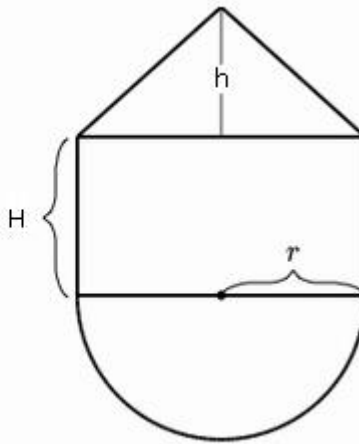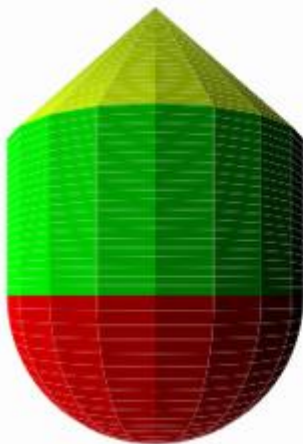
Volume of a cone is $\dfrac{1}{3} \times \pi \times r^2 \times h$

Volume of a cylinder is $\pi \times r^2 \times H$

Volume of a **whole** sphere is $\dfrac{4}{3} \times \pi \times r^3$

4. You need to prompt and read input for the height of the cone (h in the diagram), for the height of the cylinder (H in the diagram), and for the radius (r in the diagram) of the cone, cylinder, and ½ sphere.

   r is the same for all three!

5. Do not forget to declare (inside the main() function) all the variables to store values for inputs as well as for the calculated volume values.

6. Use incremental development by adding a few lines of code at a time and running it to make sure it is OK. Do not write the whole program, then try to compile it. Write only a few lines at a time, compile and fix that part, then add more.

Your output should look like this: (Please copy and paste the text from these prompts into your code! You are graded on this on Web-CAT.)

```
Please enter the radius of the tank: 11.73
Please enter the height of cone portion: 4.3
Please enter the Height of cylinder portion: 17.125

The volume of the cone portion is 619.5739.
The volume of the cylinder portion is 7402.4670.
The volume of the sphere portion is 3380.2798.
The total volume is 11402.3206.
```

4 decimal places

Run your code with several different inputs and hand check the values to make sure your code is doing the calculations right.

Programming Style

An important part of programming is using proper programming style, formatting, and comments. At this point, the most important items are:

- Use descriptive variable names
- Vertical (proper use of blank line mostly) and horizontal spacing (putting spaces around operators, indentation, etc.)
    - Indent properly
    - Skip a line between each small section of your program, so that each section is separated by a blank line,
- Have a beginning comment that describes what the program is doing (just "Homework 2" is not good enough). See the main Canvas page for Coding Guidelines about what every program header needs to contain.
- Each section (i.e. logicl chunk of code) begins with a comment describing what that section does, so that the comments alone would provide an outline of the program (It's NOT good to follow every line of code with a comment.)
- Continue typing your code on the next line if it is too long. Too long is over 80 characters. In Code::Blocks, there is a <u>column</u> indicator at the bottom-middle-ish of the screen that tells you which column the cursor is at.

Submit Your Work

To submit your work to Web-CAT to be graded.