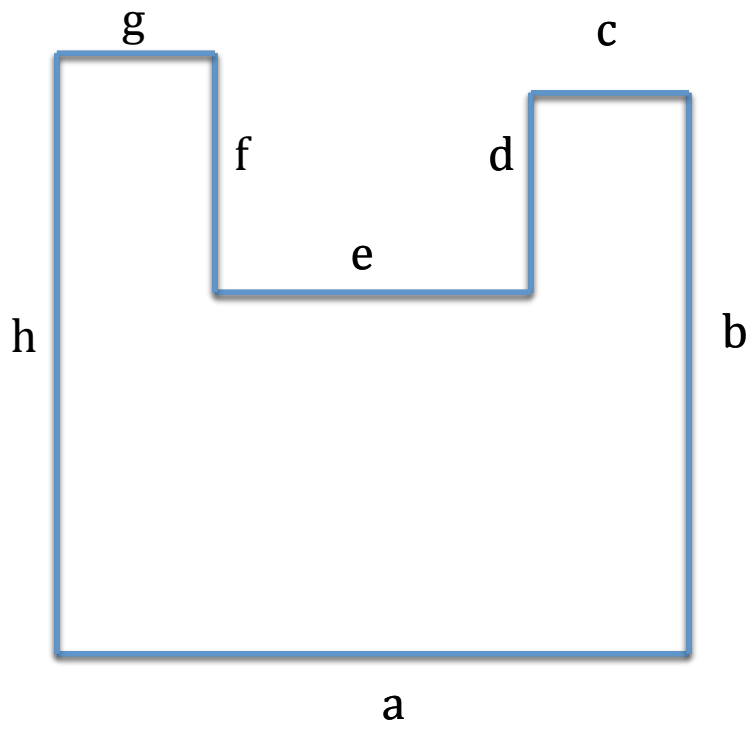
CSCE 1030
Homework Assignment 1

Overview

For this first program, you will be building an application for ABC Heating and Air Conditioning. They are a contractor for H&H Housing and are responsible for installing air conditioning and heating systems for new homes built by H&H. In order to install the proper units for each semi-custom home, ABC must determine the total volume of air in the home that will have to be "conditioned".

All homes built by H&H have similar floor plans but the sizes of the various rooms and the height of the ceiling can be customized. The program will need to prompt the user for the dimensions and then calculate the total volume of the space. Consider the diagram below:



The letters a-h represent the lengths of each of the walls in the standard floor plan. These can be customized for each home along with the ceiling height (we will call that **ht**). Also note that you do not need to ask for the length of any walls that can be computed from any data you already have. But do not be deceived by the diagram. For example G and C may not be the same length even though they appear to be in the diagram. It is also possible that a customization might make f and d the same.

Design

On a piece of paper use information given above (and a calculator) to work out what the answer should be for one or two sets of measurements.

Write down in English the sequence of steps you performed above. Pretend this is a "recipe" for someone else to follow. Now, follow your instructions and see if you can calculate the result for another set of measurements. Refine your "recipe" until it is clear. Be sure to include the steps for prompting for input etc. Type these steps into a document (Word, txt, PDF etc). Also be sure to include your algorithm steps as comments in your code file.

Implementation

Now that you have a working design, your next step is to translate the steps above into C code. Use the algorithm development techniques discussed in class to implement your solution to the problem above. Add your C code a little at a time, and compile and test as you go.

Remember to add comments to your code to explain your program. Do this before/during programming instead of waiting until the end. For example, use comments to describe the inputs, the formulas used, and any other important steps in your code.

Your program will be written in C++, not in any other computer language. You may use either type of I/O library as you prefer.

Your program will be graded based largely upon whether it works correctly on a CSE Department Unix machine.

Your program will also be graded upon your program style. At the very least your program should include:

- A consistent indentation style as recommended in the textbook and in class.
- Meaningful variable names.
- A block header comment section that includes: Your Name and Email Address, and a brief description of the program.

Your program's output should initially display the department and course number, program number, your name, and your email address.

You can assume that the user will only enter valid numeric values for the various inputs, and the relative width of the walls are valid for the room's configuration.

Your program should prompt the user to enter the various wall lengths (a-h), only

asking for the ones you really need, as well as the ceiling height (ht). You may internally use variable names of your own choice if you prefer. These should all be floating point-type numbers measured in feet (so 6.5 feet for example)

Your program should calculate and then display the total volume of air in the house. The value should be displayed with two fractional decimal places and the units of Cubic Feet.

Then you will calculate the “tonnage” of unit to be used for the house. Take the total number of cubic feet of air (the volume) and divide by 1000 rounding up to the nearest integer (think about how to do that without using a library function – i.e. simple math). Display this value with an appropriate message (e.g. “The proper tonnage for this home is a 3 ton unit”).

You will submit your program source file to the BB Learn website under the **"Homework 1"** drop box. Make sure you submit your program before the due date and time. Also note you will need to complete the assignment and then upload all the files at the same time. You cannot upload the files as you create them as BB Learn considers these to be separate submissions.

Also make certain that you prompt the user for the various input values in the order indicated in the assignment. This consistent approach by everyone will speed-up the grading process for the graders, as they will know the order of the input will always be the same for everyone.

Please be sure and test your program to make sure it is calculating the result properly. You can either do this by hand (calculating some test values on paper to see if they match what your program says), or temporarily display various intermediate values you're calculating in the process and desk check the results to make sure they are correct. The more test cases you try and you get correct answers, the more certain you will be that when the grader uses his own test cases that your program will produce the correct result.

Testing:
Test your program to check that it operates as desired with a variety of inputs. Compare the answers your code gives with the ones you get out of hand-calculations. Although your program is not required to check for incorrect inputs, observe the effect of such inputs. Try typing "hello world" when your program asks for a number. What is the result?

Documentation:
When you have completed your C program, write a short report (2-3 paragraphs) describing what the objectives were, what you did, and the status of the program. Does it work properly for all test cases? Are there any known problems? Save this report in a separate file to be submitted electronically.

Homework Submission:
In this class, we will be using electronic homework submission to make sure that all students hand their programming projects (and labs) on time.

You will submit your program source file, design document and short report as 3 separate files to the BB Learn website under the **"Homework 1"** drop box. Make sure you submit your program before the due date and time. Also note that programs which do no compile without error on the CSE Linux servers using gcc/g++ will receive a grade of 0.

NOTE: The dates on your electronic submission will be used to verify that you met the due date above. All homework up to 24 hours late will receive a 50% grade penalty. Later submissions will receive zero credit, so hand in your best effort on the due date.

Key Activities for this Programming Assignment:

Creating a source file containing your C code one of the cse Unix servers.

Understanding how to prompt the user for the various input values using the `printf()` function or the cout stream

Accepting the user's input using the `scanf()` function, also remembering to precede the input variable name with an ampersand, like: `scanf("%d",&length);`
`You may also use cin stream`

Performing the needed calculations using the various input values and constants specified in the assignment, making sure the math formula is composed properly for C syntax of mathematical expressions. This also includes properly determining the length of the other two walls based on the lengths of the four other walls in the room. Remember you may have to break the problem into smaller parts to do the computations and then assemble the intermediate answers to get the total result.

Displaying the result using the proper data formatting codes in an output command (printf or cout) command.

Compiling your source code on the Unix server using the `gcc` or g++command.

Running your program on the Unix server using the command: `./a.out`

Testing your program with various input values to verify that it consistently produces the correct result.

Uploading your final source code, your algorithm document and uploaD to the proper drop box in BB Learn