CSIS 2100 Assignment 7: Archimedes
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King Hiero II of Syracuse has hired you to write a program to determine whether or not the gold in some of his possessions is pure. You must write a program with a name of your own choosing, that will report whether each item is pure gold or not. Luckily for you, you have access to Wikipedia and can use your new found knowledge that the density of pure gold is 19.32 grams per cubic centimeter (as measured on earth).

For the decision, you will need a function that takes both the weight and the volume of the item, and returns true or false depending on whether the purity is within 1% of the expected density. That means they can be up 1% more or less than the expected density and still be considered pure by King Hiero II (though not by Swiss bankers, whose standards are somewhat higher). To make the determination, compare the volume in CCs times 19.32 to the weight in grams times 0.99 (it must be greater than this minimum) and times 1.01 (it must be less than this maximum).

Unfortunately, you don't have a scale that measures the weight of large items in grams. But the scale at a nearby Publix can measure their weight in pounds. So you will need a second function that takes pounds as an input parameter and returns the equivalent number of grams. These large items are also irregular in shape, so to measure their volume, you must immerse them in your bathtub to see how much water they displace. (You realized this one day while sitting in the tub, causing you to run out into the street shouting "Eureka!" and forgetting to cover up.) From your son's high school project on water conservation, you have already marked your bathtub for measurement in gallons. So you will need a third function that takes the volume in gallons as a parameter and returns the equivalent number of cubic centimeters.

To convert gallons to cubic centimeters, you should perform the calculation in two steps. First gallons to liters, at 3.785 liters per gallon, and then liters to cubic centimeters, at 1000 cubic centimeters per liter. Similarly to convert pounds to grams, you can convert pounds to ounces at 16 ounces per pound, and then ounces to grams at 28.35 grams per ounce.

Your main function should prompt for and read two values, the weight in pounds and the volume in gallons. The values given by the user may include a fractional part. (Main() is the only place in your code that should use cin.) The code in main should then use the other three functions to convert the units and determine whether the gold is pure. At the end it should report whether or not it is pure gold. You may use a loop to test several items while the program is still running, but that is not a requirement.

For this assignment, you may not copy work from other students. Include appropriate comments to explain what each part of your program is doing. In honor of Archimedes, you may yell Eureka! when you get it working.

As a test, 3 gallons of gold weighing 480 pounds should test pure.