Project 1

Due Monday, September 12 by 4:00pm

For this first project, you will make a python program that uses Torricelli's Law to compute the amount of time it takes for a container of liquid to drain. Under certain assumptions (in particular, the container must have constant horizontal cross-sectional area), the formula for computing the amount of time it takes for a container of liquid to drain is

$$\text{drain time} = \frac{2a}{A} \cdot \sqrt{\frac{2H}{g}}$$

In this formula, a is the cross-sectional area of the hole the liquid is draining out of, A is the horizontal cross-sectional area of the container, H is the initial height of the liquid above the hole, and $g = 9.80665$ is gravitational acceleration. See the wikipedia page on Torricelli's Law for a picture and more information. Your job is to make a program that asks the user for the values of a, A, and H, and then computes and prints the drain time. To make your program more user-friendly, you must format your output in a certain way. If you look closely at how the formula derived, it is clear that the drain time is in seconds. First of all, the user does not care about fractions of a second, so round your drain time to an integer (I prefer that you round *down* in all cases for simplicity). Now, if the hole is very small or the container very large then it may take a long time for the container to drain, which means the drain time is a large number of seconds. Your program should, whenever possible, use hours and minutes to describe the amount of drain time. Thus, your program should look like this when it is run:

```
Hello, welcome to my drain time calculator!
Give the cross-sectional area of the hole the liquid is draining out of:  0.07
Give the horizontal cross-sectional area of the container:  100
Give the height of the liquid above the hole it is draining out of:  20.1
The time it takes for the liquid to drain is:  1 hours, 36 minutes, and 24 seconds.
```

Now for a few rules to keep your program simple:

1) You can assume that the inputs given by the user are all positive integers/floating point numbers (you don't need to check that the input is 'correct').

2) Make sure you use $g = 9.80665$ exactly in your equation, and use the exact same wording/layout/formatting as seen above.

3) You can use the plural for hours, minutes, and seconds, even when there is only one (as seen in the example above, which only has one hour even though it says hours). That being said, make sure to only print hours if there are more than 0 hours, and same for minutes.

Lastly, a few rules that apply to all projects:

1) First and foremost, the Python interpreter must be able to execute your script. It is better to have a running but partial solution than a program that attempts to do all computations, but that fails to execute. Handing in an incomplete but working program is better than handing in a program that crashes or does not run at all.

2) The first line of your Python program must be

   `# MCS 260 Project One by Author`

   where you replace `Author` by your name.

2) Add comments to clarify your choice of variables and to indicate what is happening at different steps of the program.

3) Programs will be graded partly on the basis of good hygiene. Programs should be readable with a logical, clear structure and they should avoid unnecessary or overly convoluted calculations. The "PEP 8" style guide for Python helps to improve your grade in this regard.

4) Your .py file must be sent to me via email as an attachment and **in addition** must be printed out and submitted in class (so I can comment on your work easily). My email address is jbergen@uic.edu.