LAB #4  
More Programming w/ Python

In this course, all our labs involve paired programming. You do not have to keep the same partner for each lab, but you MUST work with someone in each lab, as specified in the student handout.

At this time, you need to pair with someone in the lab, and finish the rest of the lab as a pair.

(2 pts) Practice: Numbers, Logical Operators, and Variables

First, discuss how you would solve each expression based on precedence and hand write your answers to the following expressions. In addition, we will follow the standard in most programming languages, where integer arithmetic is a result from using only integers, and if one operand is a float, then the result is a floating point number. The special operator for integer division, //, is a new feature of Python 3, but this is not typical in most languages. In the following expressions, assume integer division when a divide is between integers, when determining your answers, and write down whether you would use the // or / operator for your division in each of these answers!!!

Evaluate the following expressions:

1. \(4 \div 3 \div 2\)
2. \(4 \div 3.0 \div 2\)
3. \(1 \div 2 \times 8.0\)
4. \(5 \times 10 \div 2 + 10 \div 5.0\)
5. \(3 + 2 \times 4 \div 5 + 8 + 2\)
6. \((3 + 2) \times 4 \div (5 + 8) + 2\)
7. \((3 + 2) \times 4 \div 5 + (8 + 2)\)
8. \(20.0 \div 4 \times 2^3\)
9. \(5.5 \times 2 + 4 \div 2\)
10. false and true
11. not false
12. true or false
13. not true or false and false or true
14. not ((true or false) and (false or true))
15. not true and false
16. not (true and false)
17. false and not false or false

Using variables:

\[
a = 0.0 \\
b = 1.0
\]
1. \(b - a \div 10\)
2. \((b - a) \div 10\)
3. \(a = \text{true}\)
4. \(b = \text{false}\)
5. \(\text{not } a \text{ or not } b\)

Now, look up the ASCII character set in a web browser. Determine the numbers that correspond to the letters in your full name. This includes a capital letter for your first and last name with a capital middle initial (if you have one) followed by a period, i.e. Jennifer Parham-Mocello or Jennifer R. Parham. Write down the numbers for both you and your partner.

(2 pts) Practice Python: Testing your solution

Write Python code, numbers_and_name.py, to test your handwritten solutions. Using integer or floating point division, where appropriate, write a python program that prints the values of the above expressions based on the rules for integer arithmetic. Remember, if at least one operand is a floating point number, then the result is a floating point number, otherwise it is integer arithmetic.

For Example:

```
print(4 // 3 // 2)
```

Note: for the True/False expressions make sure to type them capitalized. (ex: True or False)

Now, write a python program that uses the ordinal values from the ASCII character set that you found for your full name in #3 and prints the characters corresponding to the values. Your name should come out with the letters beside each other and spaces between your first, middle initial, and last name. In other words, you do not want the print function to automatically insert a newline at the end.

Example:

```
print(chr(79), end="")
```

Compare your handwritten solutions with your Python solutions to see if you got the correct answer. For those answers where your handwritten solution differed from the Python solution, document what caused this error. For example, did you make a typo when entering the number in Python or a logical error when calculating your solution by hand?
(4 pts) Design and Write a Program

Now, let’s design another program that takes the weight (in pounds) and radius (in feet) of a sphere as input and outputs the buoyant force. Use $\gamma = 62.4 \text{ lb/ft}^3$ as the specific weight of water, and the volume of the sphere is $(4/3)\pi r^3$. The buoyant force can be computed by

$$F_b = V \times \gamma$$

where $F_b$ is the buoyant force, $V$ is the volume of the submerged object, and $\gamma$ is the specific weight of the fluid.

Now, write the python program, buoyancy.py, that uses your design.

(2 pts) Modify Buoyancy Design and Program

How will your design for the buoyancy program change, if you want your program to inform the user if the sphere will sink or not? If $F_b$ is greater than or equal to the weight of the object, then your program will output, “This sphere will float”, otherwise it will output, “This sphere will sink.”

Modify your design from above to print a message to the user based on the buoyant force and weight of the object.

Make sure you sign-up with a TA for demoing/explaining your Assignment #4 in week 5. The doodle polls are listed on the course home page beside the TA office hours: http://classes.engr.oregonstate.edu/eecs/fall2015/cs160-001/ You are penalized for failure to schedule an appointment within the week or missing a scheduled appointment. In either case, if you are within 1 day (24 hours) of the deadline, you lose 10 points. If you are within 7 days (1 week) of the deadline, then you lose 25 points, anything outside of a week from the deadline to demo is an automatic 50 point deduction.