Lesson One

Math 6080 (for the Masters Teaching Program), Summer 2020

Part 1. Arithmetic in Python These are binary operations on **numbers**.

There are two types of numbers in Python:

• **Integers,** which are written without a decimal point, e.g. $6, 0, -1$

Python internally refers to integers as the "int" data type.

• **Real Numbers,** which written with a decimal point, e.g. $1.4, -0.887, -2.0$

Python internally refers to real numbers as the "float" data type.

There are seven basic Python **operations** on integers (and real numbers):

• $x + y$ takes two integers x and y and returns the integer sum.

• $x - y$ returns the integer difference

• $x * y$ returns the integer product

• x/y returns the **real** quotient

• $x * *y$ returns x raised to the yth power (may be an integer or real)

• $x\%y$ returns the long division integer **remainder** when x is divided by y

• $x//y$ returns the long division integer **quotient** when x is divided by y.

First Exercise. Play with these with both integers and real numbers for x and y, taking note of the type of the answer returned by Python. Try to divide by zero. Input the following:

$$6.7//1.2 \quad \text{and} \quad 6.7\%1.2$$

and try to make sense of the answers returned by Python.

Second Exercise. Implement Euclid's algorithm. Use Python to find:

$$\gcd(560014, 29652)$$

For obvious reasons, we would like to automate this process!

Part 2. Logic in Python. These seven binary operations on numbers return either True or False.

• $x == y$ returns True if $x = y$ and False otherwise.

• $x! = y$ returns False if $x = y$ and True otherwise.

• $x < y$ returns True is $x < y$ and False otherwise.

• $x <= y, x > y$ and $x >= y$ are defined similarly.

Remark. True and False are the data of another Boolean data type (literally, these are the only two possible Booleans), which Python internally refers to as "bool." Booleans have three operations, as well. Let x and y be Booleans. Then play with:

$$x \text{ and } y, \ x \text{ or } y \text{ and not } x$$

For example, not True returns False, True and True returns True, etc.

Reference. https://www.tutorialspoint.com/python/ (basic operators)