Lecture 5

##By professor Guttag

Python has two types of numbers:

* Integers

Python has arbitrary precision integers: you can make numbers as big as u want them to be

And long numbers (above 2 billion) are ended with an ‘L’

And once you get an L for any one number, the L will stay. Even for smaller numbers.

* Float – Floating point numbers – real numbers

Numbers in Python are stored in the IEEE 754 floating point standard.

This is a variant of the normal scientific notation

And the power is 2 and not 10 as we do.

it is represented as a mantissa and an exponent. where mantissa is more than or equal to 1 but strictly less than 2.

and the range of the exponent is between -1022 and 1023

we can represent numbers accurate upto 17 decimal digits.

when numbers are converted from decimal to binary for storing them in the memory, then each power if 10 is always approximate. (like 0.1,0.01,1)

print statement automatically rounds of the decimal

Most times we can just not worry about this small error!

About floats there is one thing we must always worry about: == on floats.

so if we need to check the closeness then we use:

abs(a\*a-2)<epsilon. epsilon is a really small number. we can write a function by name near or something. near(x,y) instead of x==y.

**SQUARE ROOT**

we can’t enumerate all the guesses as the real’s between any two numbers are infinite.

we need to find something else to get the square root.

we use the following steps:

* guess
* check
* improve on the guess

**Successive approximation:** We can solve many problems using this technique;

* guess = initial guess
* iterate in a range
* if f(guess) is close enough then return the guess
* else get a better guess.
* and even after all the iterations are over and we haven’t got the answer then quit with an error

**Bisection method:**

using the bisection method

guess should be on a linear space of answers

and we make a guess in the middle. and if it is smaller than the expected values then we change the space to the forward half and we make a guess at the mid point of the new space.

assert: if condition is true then it does nothing else it stops the execution citing an error.