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Physics 40: Laboratory Fifteen

Tuesday, May 19, 2020

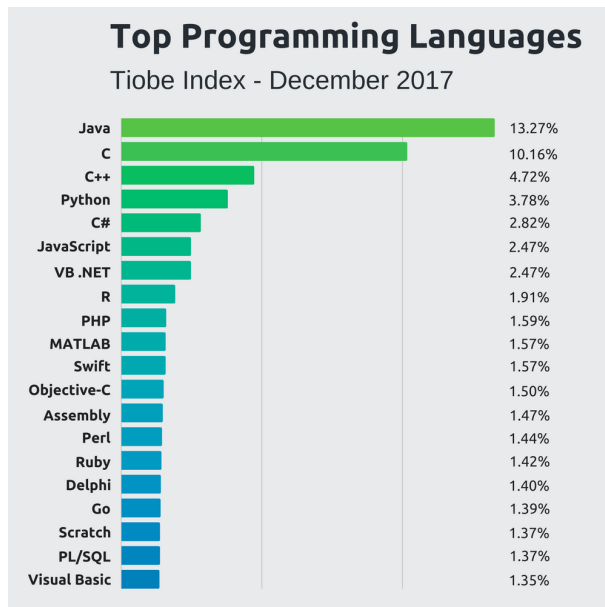
Today's Goals:

Transition to python!

There are *many* programming languages, and their popularity waxes and wanes as time goes by. Different languages might be better for one task or another, e.g. for scientific/engineering codes, for website development, for statistical analysis, etc. Other language choice considerations are ease of use and execution speed. These might be at variance with each other.

One piece of good news: learning a language gets easier once others are known. E.g. in learning C you learned about declaring variables, what loops are, what arrays are, the idea of how to organize a program, In other languages the particular words used are different, but the concepts are largely the same. (Some languages do have new features to master, e.g. 'pointers' etc, but at least you have many of the fundamentals in hand.)

Here are some lists of Programming languages and their 'popularity'.



Worldwide, Dec 2018 compared to a year ago:

Rank	Change	Language	Share	Trend
1	↑	Python	25.36 %	+5.2 %
2	↓	Java	21.56 %	-1.1 %
3	↑	Javascript	8.4 %	+0.0 %
4	↑	C#	7.63 %	-0.4 %
5	↓↓	PHP	7.31 %	-1.3 %
6		C/C++	6.4 %	-0.4 %
7		R	4.01 %	-0.3 %
8		Objective-C	3.21 %	-0.9 %
9		Swift	2.69 %	-0.7 %
10		Matlab	2.06 %	-0.3 %

[1] Using Python in “interactive” mode. Part One.

Open up python

get ”prompt” >>>

(python is ready for you to enter commands)

Type 1+1, followed by <enter>

what do you get?

Type print('Hello World!')

what do you get?

Try some basic arithmetic operations

40+2

43-1

6*7

84/2

Exponentiation: Different computer languages have different format for this.

[HW8-1] Which of the following is the correct way to do an exponential in python?

5^3

5**3

pow(5,3)

Which is the correct construction for exponentiation in C?

[HW8-2] What are the results of the following in an interactive python window?

a) type(2)

b) type(2.0)

c) type('Hello!')

d) type('2.0')

What does the command ‘type’ ask python to tell you?

Explain the difference between a) and b).

Explain the difference between b) and d).

[HW8-3] Ask python to compute 7/3

Ask python to compute 7.0/3.0

Why are they different? Would they be different in C?

Important: Apparently in updating python2 to python3 a decision was made to do real arithmetic even for 7/3. I think this is a *terrible* choice! See next page for why.

Try this sequence of commands:

```
n=7
```

```
type(n)
```

```
m=3
```

```
type(n)
```

```
n/m
```

python3 will tell you that n and m are integers, but then proceed to do floating point division.

In my mind that is *totally nuts*!

Compute $7/3$, $8/3$, $9/3$, $10/3$, $11/3$, $12/3$

What is python doing?

Compute $7\%3$, $8\%3$, $9\%3$, $10\%3$, $11\%3$, $12\%3$

What is python doing? How would you do this in C?

In python, an assignment statement creates a new variable and gives it a value.

Try this in your python terminal:

```
n = 17
```

```
print(n)
```

Then try this

```
n+25
```

What happens?

[HW8-4] You can also assign a variable a string. Try this command sequence:

```
a='Hagrid likes dragons'
```

```
print(a)
```

```
type(a)
```

```
a+25
```

What happens? Why?

```
b=' and Norbert is actually Norberta'
```

```
a+b
```

What happens? Why?

```
print(A)
```

What happens?

```
Why?
```

```
N+25
```

[HW8-5] Fun math interlude! What does python give for

```
16**0.5
```

Explain why it makes sense for the 0.5 power be a square root.

[HW8-6] For `a='Hagrid likes dragons'`

Do the commands

```
a-4
```

```
a/4
```

```
a**4
```

have any meaning? Why or why not?

[2] Using Python in “interactive” mode. Part Two.

As we saw in learning C, we often want the ability to ask the computer to perform different tasks depending on values of some variable.

Try giving python these commands:

```
5==5
```

```
5==6
```

Try giving python these commands:

```
5 > 6
```

```
5 < 6
```

```
5 >= 5
```

```
17 <= 17
```

```
23! = 2
```

[HW8-7] Discuss similarities/differences between python and C syntax in the above constructions.

Now try this:

(Note 1: hit the 'enter' key after each line.)

(Note 2: Try it with and without indenting before the 'print' statement.)

```
x=5
```

```
if x>0:
```

```
    print(' x is positive ')
```

[HW8-8] Describe what happens with this sequences of python commands:

```
x=-3
```

```
if x>0:
```

```
    print(' x is positive ')
```

Let's write something that begins to look like a piece of code!

```
x = int(input("Please enter an integer: "))
```

```
if x%2 ==0:
```

```
    print('x is even')
```

```
else:
```

```
    print('x is odd')
```

Try playing around with indenting and not indenting.

In C, the curly brackets } and { tell the computer where 'for loops' and 'if statements' begin and end. Indentation plays a similar role in python.