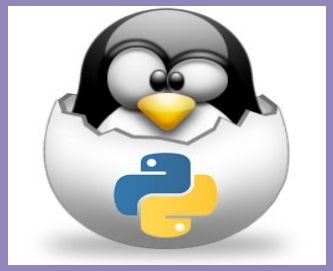
Learning to Program With Python – Part 2



Letters, Numbers, and Math (yes, math!!)

Based on the book:

Snake Wrangling for Kids, Learning to Program with Python

by Jason R. Briggs

(Version 0.7.7-python2.7, modified by SJL)

Presented by

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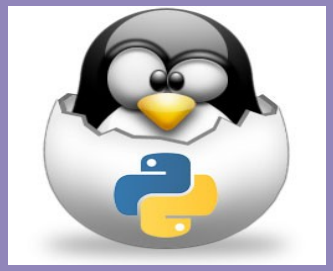
(we are also open source Gentoo Linux / Yocto developers)

Numbers and Math

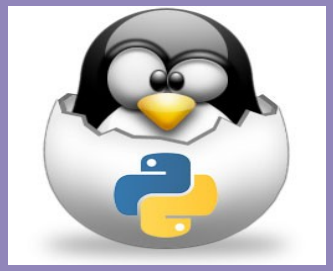


- 8 multiplied by 3.57 equals. . .
  - `>>> 8 * 3.57  <enter>`
  - `28.559999999999999`
- Why are there so many digits?
- Basic arithmetic operators in Python:

+	Addition
-	Subtraction
*	Multiplication
/	Division

- Order of operations is important!
- When in doubt, use parentheses
  - `>>> print((5 + 30) * 20)`

Variables and Types

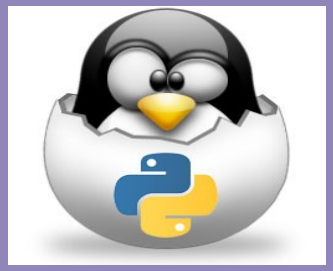


- A ‘variable’ in programming is just a place to put something
  - Can be like a variable in algebra
  - Can also be almost anything else
  - Really just a memory location with a name
- Python example:

```
>>> fred = 100
>>> print(fred)
100
```

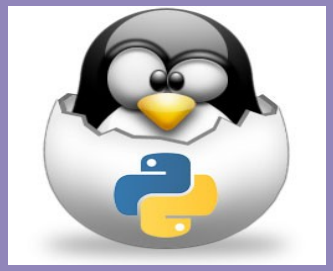
- Upper and lower case letters are *different*
- Integers and floating point numbers are *different*
  - Fred != fred whereas 2 and 2.0 are *different types*

Numbers and Strings



- A variable is created when you name it
  - fred = 200 (not a meaningful name)
  - number_of_students = 200 (much better)
  - Variable names can use letters, numbers, underscore (but can't start with a number or have spaces)
- Basic “types” of variables common across most languages
  - Integers – fixed range, signed or unsigned
  - Floating point numbers – anything with a decimal
  - Strings – a string of characters (even just one)
  - All can be considered different kinds of “objects”
- Python infers the type from how it's used
  - `fred = “200”` is a string, but `fred = 200` is an integer

More With Strings



- Your first program (remember part 1?) prints a string

```
>>> print ('Hello, world!')
Hello, world!
>>> fred = 'this is a string'
>>> len(fred)
16
```

- If 10 * 5 = 50, what is 10 * 'a' ?

```
>>> print(10 * 'a')
aaaaaaaaaa
```

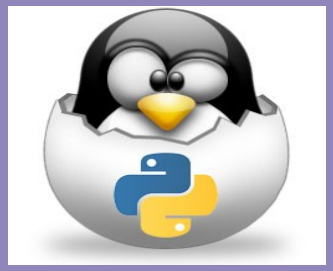
- Using '%s' as a placeholder for a value

```
>>> mytext = 'I am %s years old'
>>> print(mytext % 12)
I am 12 years old
```

- Adding an integer and a string

```
>>> print(10 + 'a')
```

More Useful Data Types



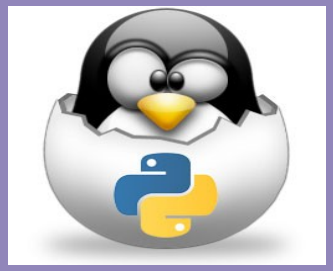
- A shopping list (sort of) using a string:

```
>>> shopping_list = 'eggs, milk, cheese, celery, peanut butter, baking soda'
>>> print(shopping_list)
eggs, milk, cheese, celery, peanut butter, baking soda
```

- A shopping list (sort of) using a list:

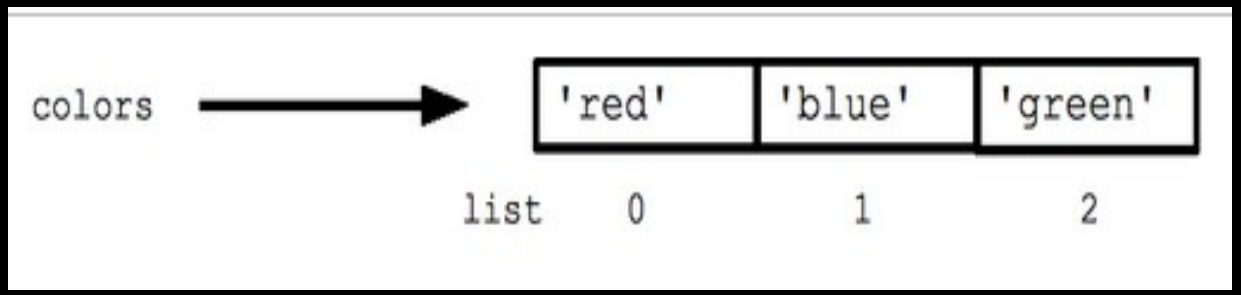
```
>>> shopping_list = [ 'eggs', 'milk', 'cheese', 'celery',
... 'peanut butter', 'baking soda' ]
>>> print(shopping_list)
['eggs', 'milk', 'cheese', 'celery', 'peanut butter',
'baking soda']
```

Lists and Objects



Creating a list in Python:

```
>>> colors = ['red', 'blue', 'green']
>>> print colors[0]    ## red
red
>>> print colors[2]    ## green
green
>>> print len(colors)  ## 3
3
```



Q: What happens if you need a variable to hold several different things?

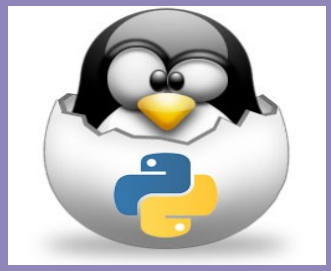
A: Make a list!

The native higher-level "container" types in Python include:

- Lists
- Dictionaries
- Tuples

(aka Abstract Data Types or ADTs)

More About Lists and Objects

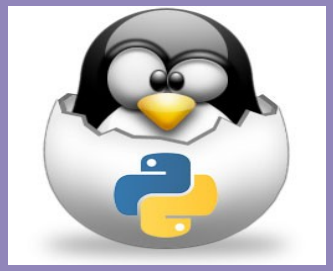


Almost everything in Python is an “object”. Objects have built-in “methods” (or functions) which are invoked via dot notation. Since the list type is an object, some common list methods are shown below:

- list.append(elem) -- adds a single element to the end of the list. Common error: does not return the new list, just modifies the original.
- list.insert(index, elem) -- inserts the element at the given index, shifting elements to the right.
- list.extend(list2) adds the elements in list2 to the end of the list. Using + or += on a list is similar to using extend().
- list.index(elem) -- searches for the given element from the start of the list and returns its index. Throws a ValueError if the element does not appear (use "in" to check without a ValueError).
- list.remove(elem) -- searches for the first instance of the given element and removes it (throws ValueError if not present)
- list.sort() -- sorts the list in place (does not return it)
- list.reverse() -- reverses the list in place (does not return it)
- list.pop(index) -- removes and returns the element at the given index. Returns the rightmost element if index is omitted (roughly the opposite of appen()).

Note that these are ***methods*** on a list object, *“in”* is a keyword, and `len()` is a function that takes the list (or other object) as an argument.

A Word or Two About Language Keywords



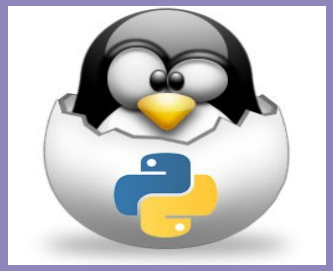
Depending on the version, there are 20 – 30 or so words reserved as language keywords, meaning you cannot use them as variable names, etc (see Appendix A for a list).

Although other words used as function or other object names are not “reserved”, they can still cause a name clash if used without full dot notation.

One way to minimize or avoid name clashes is to import the top-level library object and use dot notation to call the function:

```
>>>> import math
>>>> print math.pi
3.14159265359
```

Hands-On



Task 1:

Make a list of your favorite toys and name it toys.
Make a list of your favorite foods and name it foods.
Join these two lists and name the result favorites.
Then print the variable favorites.

Task 2:

Create variables for your first and last name. Now create a string and use place-holders to add your name and print it.