A first step in programming

with Python 

Course Outline

Week 1
- Overview
  - Motivation
  - Setup

Week 2
- Types I
  - Numeric: Int, float
  - Sequence: String
  - Type conversion

Week 3
- Types II
  - Sequence Types: List
  - Mapping Types: Dict

Week 4
- Operators
  - Boolean & comparisons
  - Keywords & variables

Week 5
- Decisions I
  - if - elif - else
  - switch

Week 6
- Decisions II
  - for & while loops
  - break, continue, pass

Week 7
- Functions
  - Definition
  - Invocation

Week 8
- Functions II
  - Built-in & Libaries
  - LEGB scope

Week 9
- Final project I

Week 10
- Final project II
- Next steps

Week 1: Overview

Part I: Programming at 10 000 feet

Motivations

- Why?
- Course aims
- Resources

A Program

- What is a computer
- What is a program?
- How are programs executed?

Part II: The Python programming language

- What is it?
- Who uses it?
- Why Python

Part III: Setup

- Setup Idle
- The Python shell

Part IV: Homework

- Writing your first “script”

Motivations

Arguments against

I do not want to be a software engineer
I do not need to know how my car works
I can already use Excel and Word

Arguments For

Personal

Low barrier to entry
Marketability for jobs
Active versus passive participation

Economic

Job market
Collaboration, innovation, and entrepreneurship
*Trend toward automation and computer aided-decision making

Sociological/Political*

Centralization of technology
Privacy
**Biases inherent in technology

*Tyler Cowen, "*Average Is Over: Powering America Beyond the Age of the Great Stagnation" (2013)*
**Douglas Rushkoff, "*Program Or be Programmed: Ten Commands for a Digital Age" (2010)*

Broad Aims

This course IS...

Aimed at novices

Used to engender enthusiasm for programming

Aimed at emphasizing applied programming

Based on the concept of mentorship and personal guidance

A basis for in-depth study of computers, programming, web development...

This course is NOT...

A course in computer science

Promising to turn you into a software developer

Aimed at front-end web design or web development

A comprehensive course in Python programming

Resources

Course

Website

www.jeffreyvwong.ca/learning
Blogs, materials, discussion

Books

Gentle

Paul Barry, “Head First Python” (2011)
Zed A. Shaw, “Learn Python The Hard Way” (2010)

Verbose

Mark Luz, “Learning Python” (2009)

Web

Official Website for the Python Programming Language:

http://www.python.org
http://docs.python.org/2/library/index.html

Tutorialspoint:

http://www.tutorialspoint.com/python/index.htm
This tutorial has been designed for software programmers with a need to understand the Python programming language starting from scratch.

stackoverflow: http://stackoverflow.com/
“Stack Overflow is a question and answer site for professional and enthusiast programmers”

What is a computer?

Definitions

A computer can be defined broadly as any of a class of man-made devices or systems that can modify data in some meaningful way

- The Linux Information Project (http://www.linfo.org/)

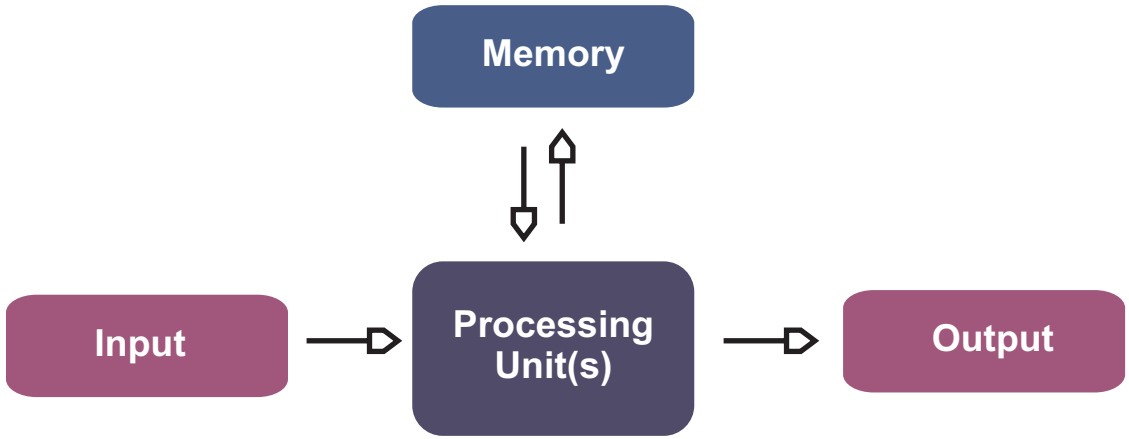
A computer is a general purpose device that can be programmed to carry out a set of arithmetic or logical operations. Since a sequence of operations can be readily changed, the computer can solve more than one kind of problem.

-Wikipedia (http://en.wikipedia.org/wiki/Computer)

"Fathers" of computing

George Boole, Charles Babbage, Claude Shannon, Alan Turing

A modern, digital computer



What is a program?

Definitions

A program is a sequence of instructions understandable by a computer's central processing unit (CPU) that indicates which operations the computer should perform on a set of data

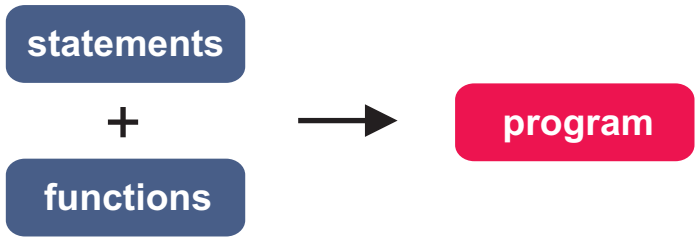
- The Linux Information Project (http://www.linfo.org/)

A loose correspondence

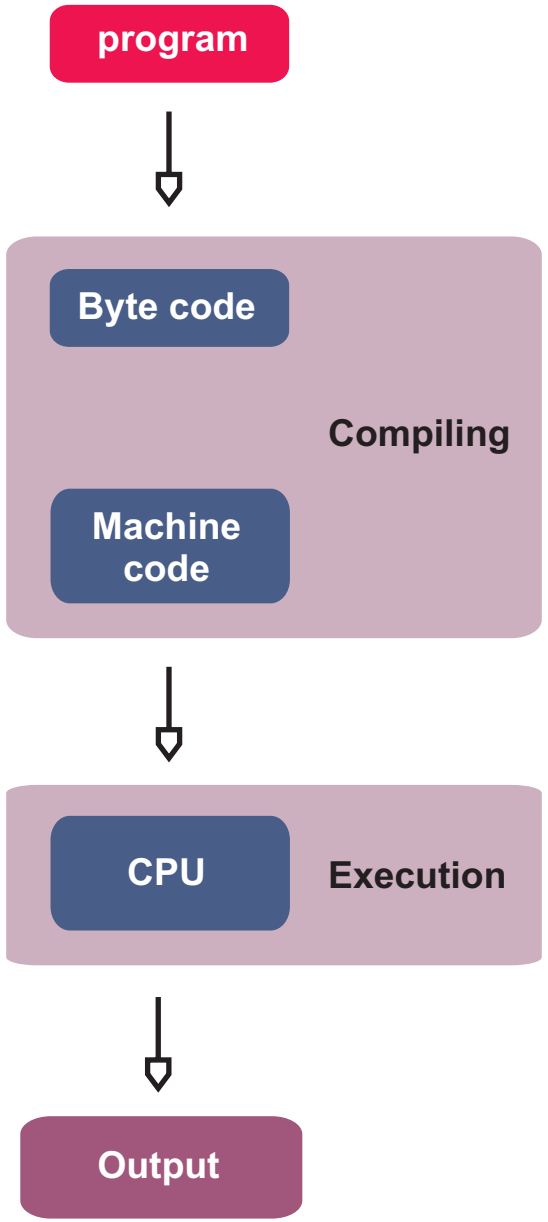
Programming Language	Natural Language
Expression	Noun phrase
Operator	Verb
Statement	Sentence

Modern languages

- Are well-defined by a grammar
- Are unambiguous
- Are expressive
- Admit an infinite number of utterances



The Life of a Program



In high-level languages, a list of human-readable instructions (e.g. hello.py file)

Translates the program
to a machine-readable set of instructions
(lexing and parsing)

For Python, compiler produces byte code
used by Python Virtual Machine

Instructions in binary (1's and 0's)
executed directly

A Python program

Definitions

A program is a sequence of instructions understandable by a computer's central processing unit (CPU) that indicates which operations the computer should perform on a set of data

- The Linux Information Project (http://www.linfo.org/)

Breaking down a Python program

Statement:

Section of code Python can execute

"Command"

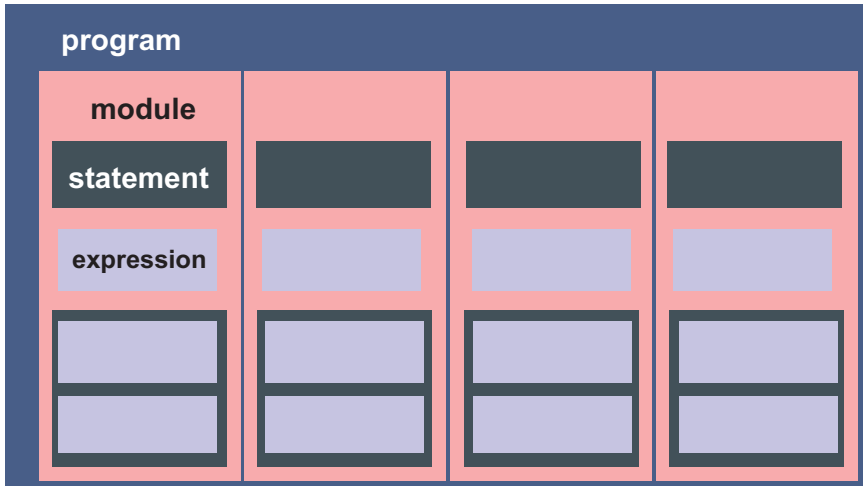
e.g. print "Jeff"

Expression:

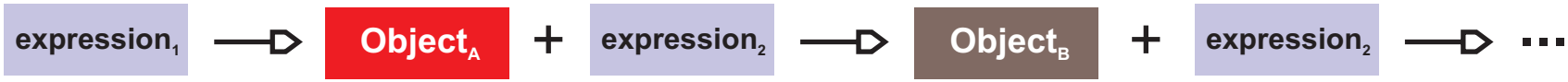
Combination of variables/values/operators representing a single result

"Request"

e.g. x = 1+1



Expressions create and process "objects"



Object is a place in memory storing

1. *value*
2. *sets of operations for value*

Setup: IDLE IDE

Definitions

An Integrated Development Environment (IDE) is a Graphical User Interface (GUI)- based software application that aids software programmers in software development. An IDE normally consists of a source code editor, build automation tools and a debugger

-Wikipedia (http://en.wikipedia.org/wiki/Integrated_development_environment)

IDLE Basics

Installation

IDLE is bundled with Python installation (http://www.python.org/getit/)

Components

1. Interactive Shell

Interactive expression entry

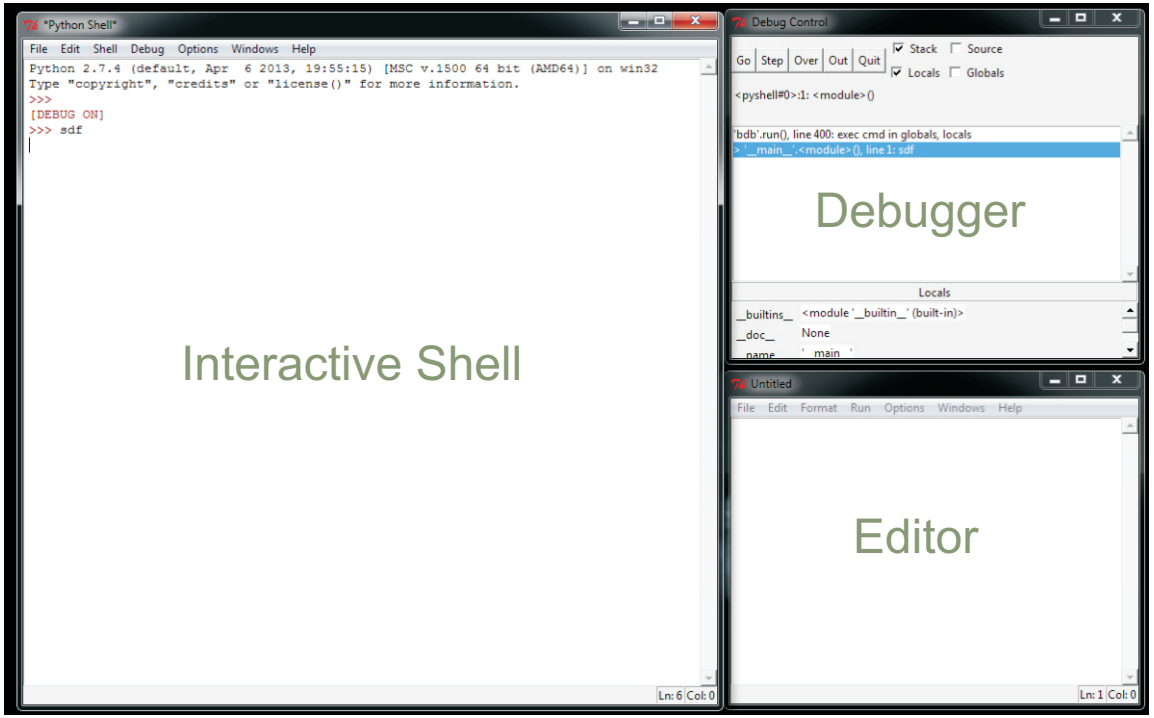
2. Editor

Source code entry

3. Debugger (advanced)

Stepping

'Breakpoints'

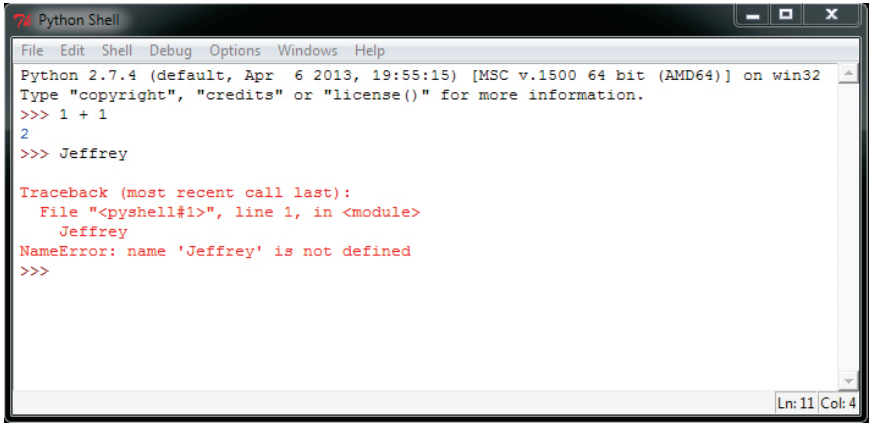


IDLE: Python Shell

Touring the Shell

Version (2.7.4)

Several differences in Python 3.x.x
http://docs.python.org/3/whatsnew/3.0.html



User Input

Interactive prompt (>>>)
Where statements are entered
Entered one at a time
Not saved (Editor...)

Python Output

Valid statements are “echoed” back to Python Shell (blue)
Invalid statements echoed back (red)

Errors and Bugs

Bug

Valid code which produces unexpected or unwanted results
May go undetected

Error

Invalid statements - Python does not understand

Exception

Valid statements which have errors during program execution

Dealing with Failure

Errors

These statements are invalid when it comes to Pythons grammar rules
Python complains about not being able to **understand** your command

Ex. 1.1

```
>>> jeff wong
SyntaxError: invalid syntax
```

Exceptions

These are valid when it comes to Python's grammar rules
Python complains about not being able to unambiguously **execute** commands

Ex. 1.2

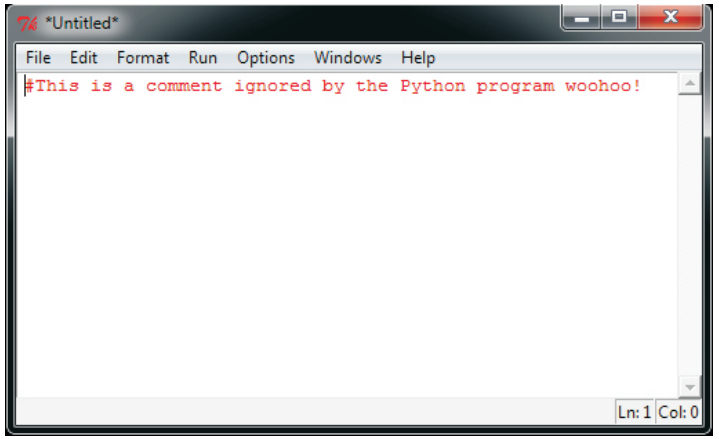
```
>>> jeff

Traceback (most recent call last):
  File "<pyshell#7>", line 1, in <module>
    jeff
NameError: name 'jeff' is not defined
```

Strategy:

The Python compiler will help you find the Exception with a 'stack trace'. With this info you narrow down the suspected error:

1. Find the 'File' - In the shell, there is no file
2. Find the 'line' - In shell, line numbers start from last
3. Find and interpret TypeError - Here, a NameError is thrown
   http://docs.python.org/2/library/exceptions.html#bltin-exceptions
4. Correct error, try again!

IDLE: Python Editor



Touring the Editor

How to get to the editor

Python Shell

"File -> New Window" tab

Shortcut (windows)

Ctrl+N

At start-up

"Options -> Configure IDLE" in Shell

"General" tab

Select "Open Edit Window" radio button for "Startup Preferences"

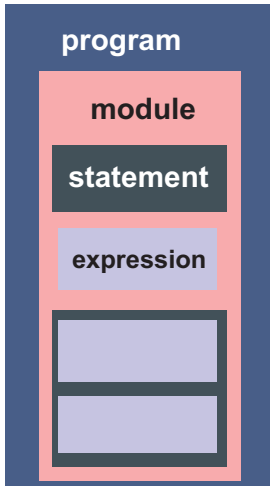
User Input

Effectively a text editor (Notepad)

Used to write Python "modules"

Can be saved to disk

Not immediately executed by Python



Running a script

Editor

"Run -> Run Module" tab

Shortcut (windows)

F5

Python Output

Valid statements are NOT "echoed" back to Python Shell

Invalid statements echoed back in Shell

Summary & Homework

Programming: From 10 000 feet

A brief description of a computer program

Setting up Python

A tour of the Python Shell

A tour of the Python Editor

Homework 1

1. Setup Python and IDLE on your computer and operating system

2. Play around with the IDLE Shell for Python

3. Create and run your first script
   - activate the Python Editor
   - create and save a file named “helloWorld.py”
   - execute the file in the Python Shell

   Hint: Statement that outputs your text (<text>) to Shell :
   >>> print “<text>”
   for Python 3 this is:
   >>> print(”<text>”)