

PROGRAMMING BASICS



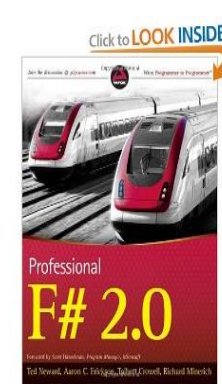
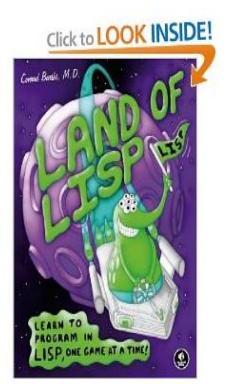
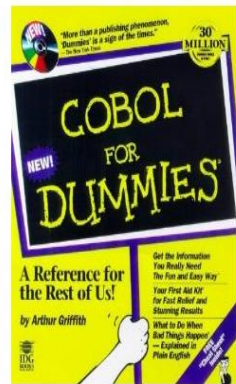
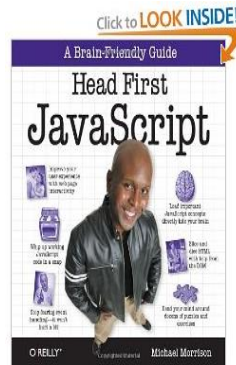
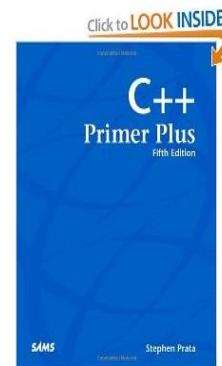
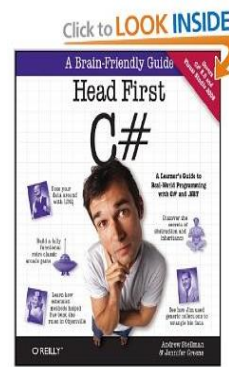
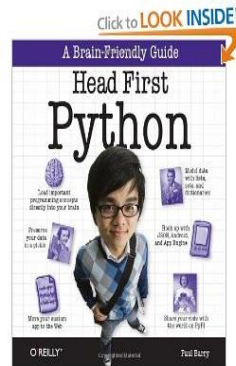
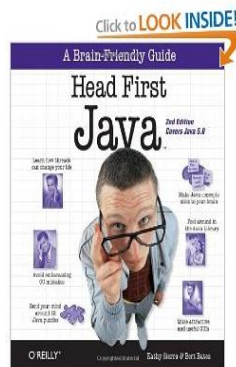
<http://www.flickr.com/photos/oskay/472097903/>

Outline

- Programs and Languages
- Introduction to the Idle Shell / Editor
- Our First Program
 - Comments
- Algorithms

Becoming a Programmer: Step 1

Choose a language...



and hundreds more...

In this Course: Python



- **Advantages**
 - Widely used, modern
 - Freely available, cross-platform
 - Simpler to learn than other languages
- **No perfect single language**
 - You'll learn many other languages
 - C/C++, assembly, Java, C#, JavaScript, PHP...
 - Programming skills translate easily between them



"There are only two kinds of languages: the ones people complain about and the ones nobody uses."

-Bjarne Stroustrup, father of C++

Your First Program



http://www.zazzle.com/baby_girls_first_java_program_hello_world_tshirt-235063563751392326 \$23.95

How Python Works

Source code:

Plain text file created
in some editor
(notepad, vi, TextEdit,
Idle editor, ...) or typed
into the Python shell

```
import dis
def example(x):
    for i in range(x):
        print(2 * i)
```

Example.py



“compiling” `% python Example`

Python bytecode:

Intermediate language
that any device
running Python can
understand (humans
generally ignore this)

```
>>> dis.dis(example)
2      0 SETUP_LOOP                28 (to 30)
      2 LOAD_GLOBAL                 0 (range)
      4 LOAD_FAST                   0 (x)
      6 CALL_FUNCTION               1
      8 GET_ITER
>>   10 FOR_ITER                    16 (to 28)
      12 STORE_FAST                 1 (i)

3      14 LOAD_GLOBAL                 1 (print)
      16 LOAD_CONST                 1 (2)
      18 LOAD_FAST                   1 (i)
      20 BINARY_MULTIPLY
      22 CALL_FUNCTION              1
      24 POP_TOP
      26 JUMP_ABSOLUTE              10
>>   28 POP_BLOCK
>>   30 LOAD_CONST                 0 (None)
      32 RETURN_VALUE
```

“Disassembled” bytecode

How Python Works

Python

bytecode:

Intermediate language
that any device
running Python can
understand (humans
generally ignore this)

“running”

```
>>> dis.dis(example)
2      0 SETUP_LOOP             28 (to 30)
      2 LOAD_GLOBAL              0 (range)
      4 LOAD_FAST                0 (x)
      6 CALL_FUNCTION           1
      8 GET_ITER
  >>  10 FOR_ITER                 16 (to 28)
      12 STORE_FAST              1 (i)

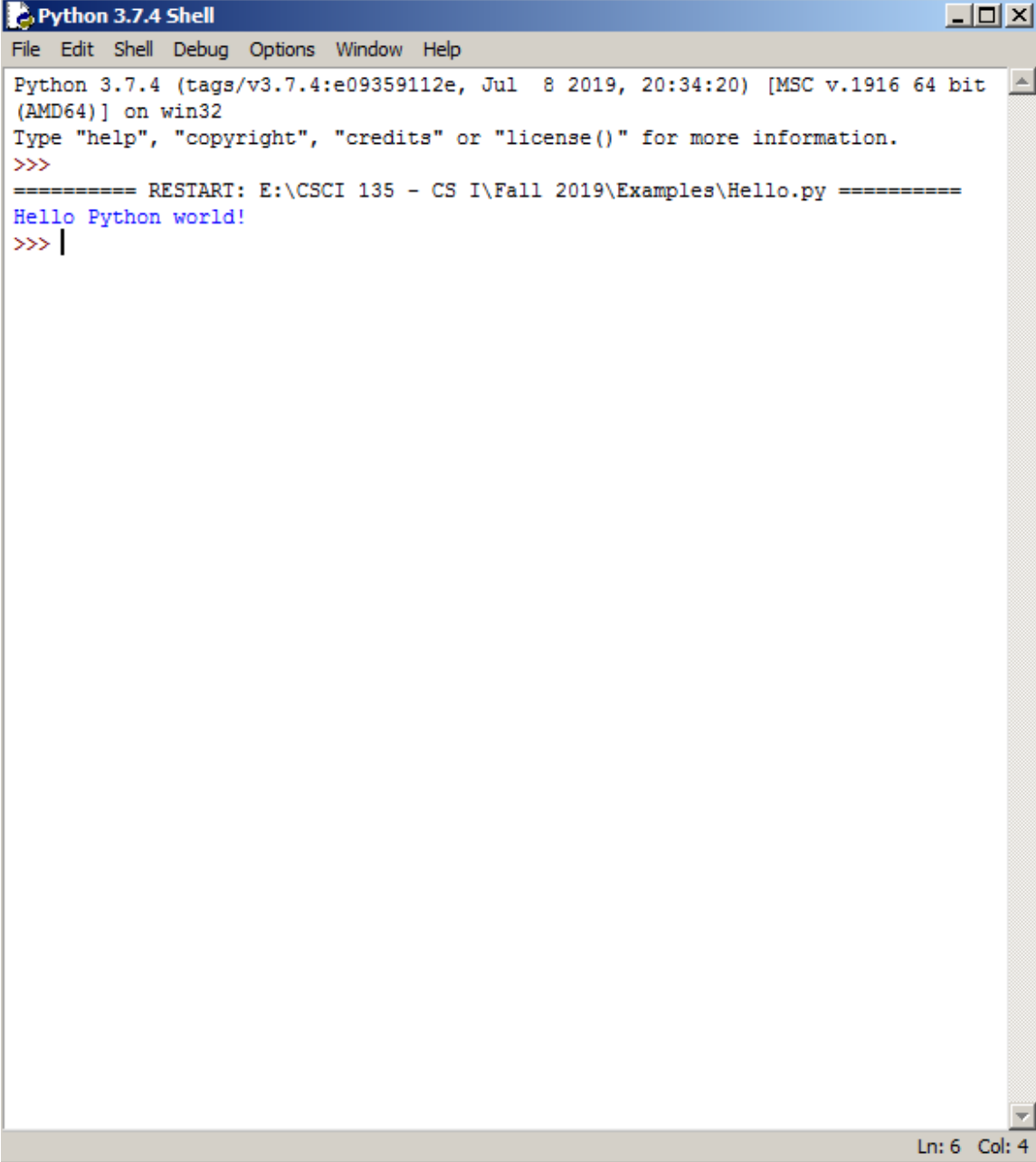
3      14 LOAD_GLOBAL              1 (print)
      16 LOAD_CONST              1 (2)
      18 LOAD_FAST                1 (i)
      20 BINARY_MULTIPLY
      22 CALL_FUNCTION           1
      24 POP_TOP
      26 JUMP_ABSOLUTE          10
  >>  28 POP_BLOCK
  >>  30 LOAD_CONST              0 (None)
      32 RETURN_VALUE
```

“Disassembled” bytecode



```
Administrator: Command Prompt
E:\CSCI 135 - CS I\Fall 2019\Examples>python Hello.py
Hello Python world!
E:\CSCI 135 - CS I\Fall 2019\Examples>
```

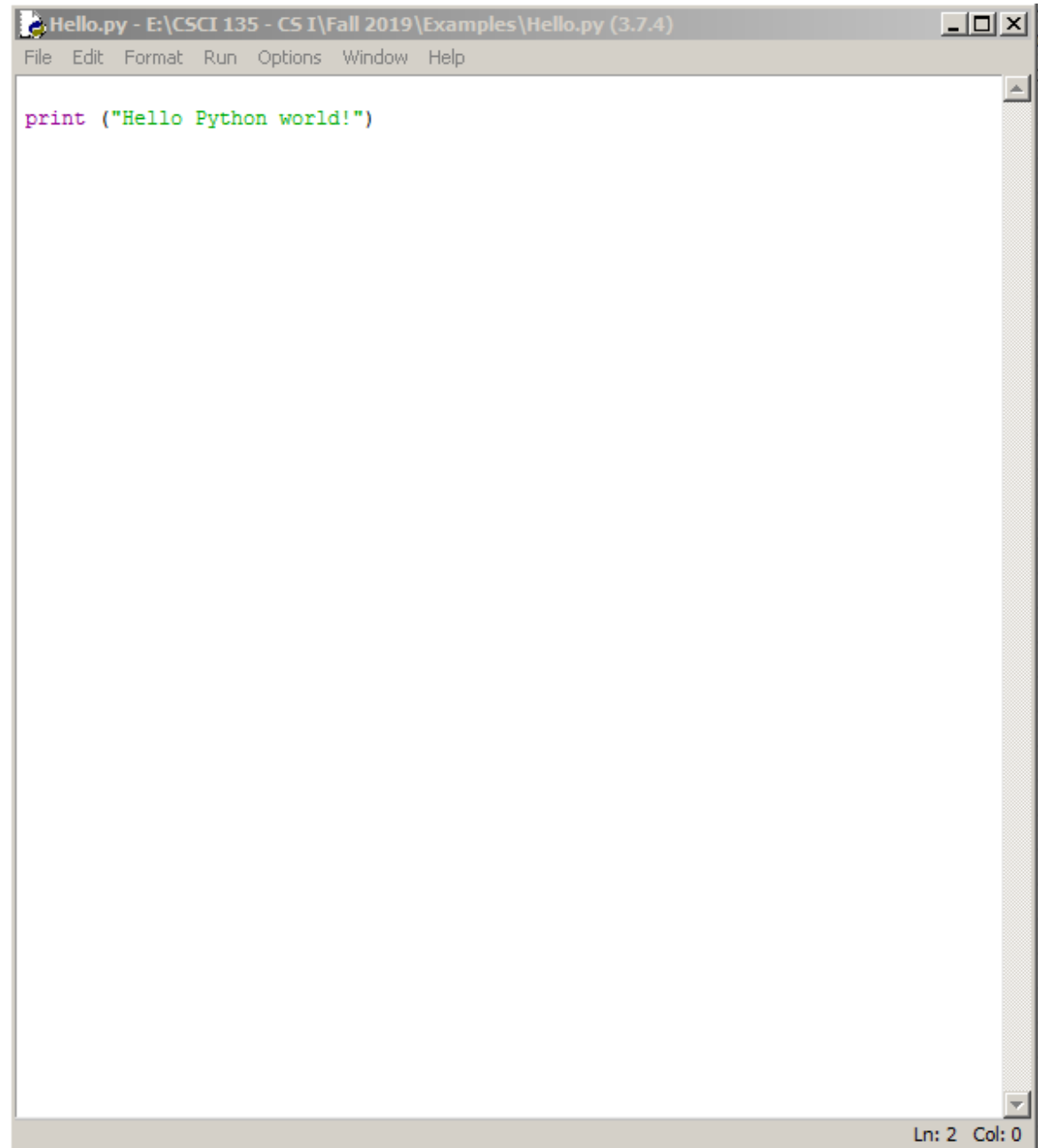
Idle – Python Shell



```
Python 3.7.4 Shell
File Edit Shell Debug Options Window Help
Python 3.7.4 (tags/v3.7.4:e09359112e, Jul 8 2019, 20:34:20) [MSC v.1916 64 bit
(AMD64)] on win32
Type "help", "copyright", "credits" or "license()" for more information.
>>>
===== RESTART: E:\CSCI 135 - CS I\Fall 2019\Examples\Hello.py =====
Hello Python world!
>>> |
```

Ln: 6 Col: 4

Idle – Python Editor

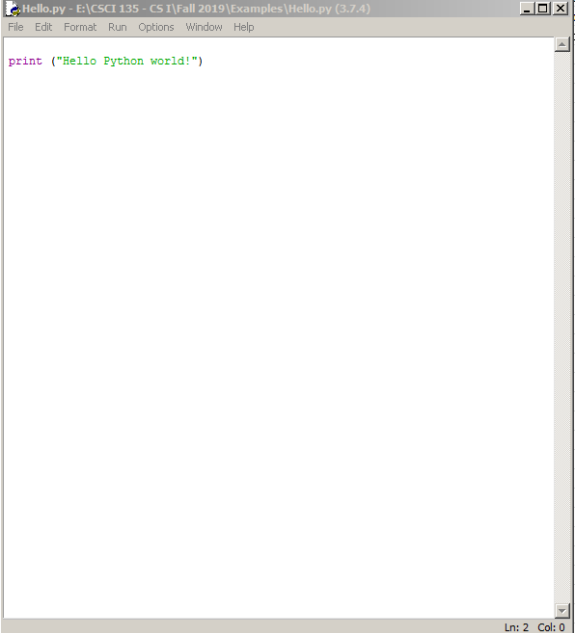


The image shows a screenshot of the Python Idle editor. The window title is "Hello.py - E:\CSCI 135 - CS I\Fall 2019\Examples\Hello.py (3.7.4)". The menu bar includes "File", "Edit", "Format", "Run", "Options", "Window", and "Help". The main text area contains a single line of Python code: `print ("Hello Python world!")`. The status bar at the bottom right indicates "Ln: 2 Col: 0".

```
print ("Hello Python world!")
```

Idle Python Editor

- **Recommended** but not required
- **Free**
- Helpful features:
 - **Syntax highlighting**
 - Run code from editor
- We will use mostly as a **text editor**
 - Ignoring many of its features
- How to install?
 - See course web site, **resources page**
- Can use any text editor / Python editor that you like, though



The screenshot shows a window titled "Hello.py - E:\CSCI 135 - CS I\Fall 2019\Examples\Hello.py (3.7.4)". The window contains a single line of Python code: `print ("Hello Python world!")`. The code is syntax-highlighted, with `print` in purple, the opening parenthesis in green, the string in red, and the closing parenthesis in green. The window has a menu bar with "File", "Edit", "Format", "Run", "Options", "Window", and "Help". The status bar at the bottom right shows "Ln: 2 Col: 0".

Anatomy of a Python Program

```
# This is a comment
# Python ignores anything after the # sign
# This is how you should put your name and a description of your
#     code at the beginning of a program

# Name: Michele Van Dyne
# Description: Takes a name as input, prints a greeting to that name,
#     if it is the name of the prof, prints goodbye prof, otherwise just
#     prints goodbye
name = input("Please enter your name: ")
print(f"\nHello, {name}!")
if name == "Michele":
    print("Goodbye, professor")
else:
    print("Goodbye")
```

Some Terminology

OFFICIAL

DEFINITION

- ***Statement*** – an instruction to the computer
- ***Syntax*** – the grammar rules for a programming language
- ***Flow of Control*** – the order in which instructions are executed

Algorithms

- By designing algorithms, programmers provide actions for the computer to perform.
- An *algorithm* describes a means of performing an action.
- Once an algorithm is defined, expressing it in Python (or in another programming language) usually is easy.

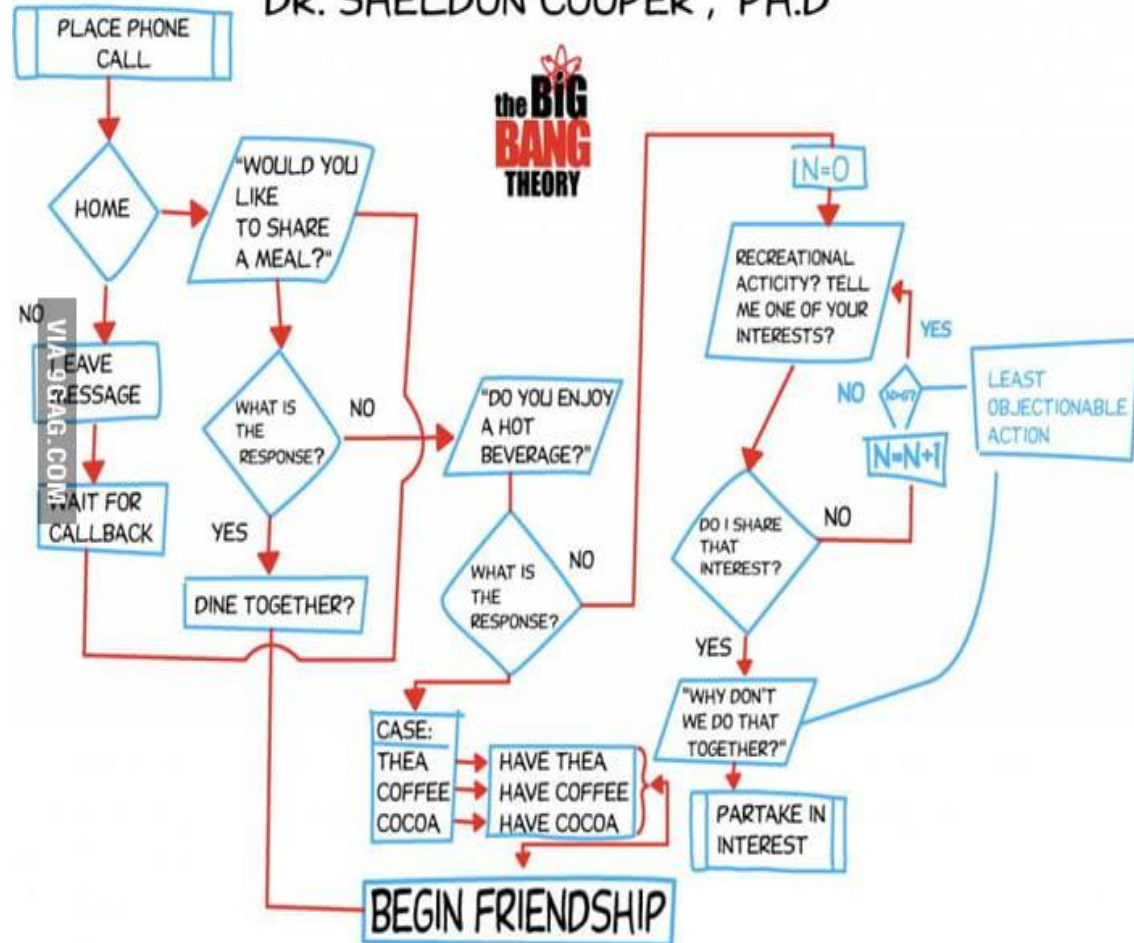


Algorithms

- An algorithm is a set of instructions for solving a problem.
- An algorithm must be expressed completely and precisely.
- Algorithms usually are expressed in English or in *pseudocode*.

THE FRIENDSHIP ALGORITHM

DR. SHELDON COOPER, PH.D



Example: Total Cost of All Items

- Write the number 0 on the whiteboard.
- For each item on the list
 - Add the cost of the item to the number on the whiteboard
 - Replace the number on the whiteboard with the result of this addition.
- Announce that the answer is the number written on the whiteboard.



Summary

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- Our First Program
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- Algorithms

