CSc 110, Spring 2017

Introduction to Programming I

Lecture 1: Introduction; Basic Python Programs
Adapted from slides by Marty Stepp and Stuart Reges
CSc 110: Introduction to Computer Programming I

```python
import os
curr_path = os.getcwd()
ignore_set = set(['__init__.py',
                  'count_source_lines.py'])

Yeah, he's a parser-tongue.

I didn't know Harry spoke Python.
```
Course Staff

• Allison Obourn (aeobourn@cs.arizona.edu)
  • B.S. M.S. Computer Science and Engineering - University of Washington
  • Lecturer - University of Washington

• Janalee O’Bagy (jobagy@cs.arizona.edu)
  • B.S. Math, Ph.D. Computer Science – University of Arizona
  • Academia – University of Virginia
  • Industry
    • High Availability Systems Architect (clients such as Apple, Inc.)
    • Software Developer (part of a team that implemented a soft real-time version of Java)
    • Independent Futures Trader (S&P mini-Futures)

• Section Leaders
  • Your primary point of contact
  • Ask them about their experiences in CSc
Computer Science

• CS is about PROCESS – describing how to accomplish tasks
  • Algorithm: a step-by-step procedure for solving a problem
  • Computers are “brainless” machines that execute specific instructions; they have perfect memories
  • Our task is to develop those very specific instructions for the problem at hand

• Computers are a tool
  • Currently the best implementation platform
  • What kinds of problems can they solve?

• Science?
  • More like engineering, art, magic...
  • Hypothesis creation, testing, refinement important
Take this course if you...

• ... like solving problems
• ... like building things
• ... (will) work with data sets or very large data sets
• ... are curious about how Facebook, Google, etc work
• ... have never written a computer program before
• ... are shopping around for a major
  • 110 is a good predictor of who will enjoy and succeed in CSc
Programming

• **program**: A set of instructions to be carried out by a computer

• **program execution**: The act of carrying out the instructions contained in a program.

• **programming language**: A set of rules used to describe computations in a format that is readable by humans.
Programming

• A **programming language specification** consists of two parts

  • **syntax**: specifies the sequences of symbols that are valid programs in the language
  
  • **semantics**: specifies the meaning of a sequence of symbols

Example of syntax and semantics from math:

(3,8)  
a point in a coordinate plane
Some modern languages

• **procedural languages**: programs are a series of commands
  • **Pascal** (1970): designed for education
  • **C** (1972): low-level operating systems and device drivers

• **functional programming**: functions map inputs to outputs
  • **Lisp** (1958) / **Scheme** (1975), **ML** (1973), **Haskell** (1990)

• **object-oriented languages**: programs use interacting "objects"
  • **Smalltalk** (1980): first major object-oriented language
  • **C++** (1985): "object-oriented" improvements to C
    • successful in industry; used to build major OSes such as Windows
  • **Python** (1991):
    • The language taught in this course
Why Python?

• Expressive language
  expresses complex ideas in a simple way
  strong philosophy
  well-designed

• Object-oriented

• Pre-written software

• Widely used
A Python program

```
print("Hello, world!")
print()
print("This program produces")
print("four lines of output")
```

- **Its output:**

  Hello, world!

  This program produces
  four lines of output

- **console:** Text box into which the program's output is printed.
**print**

- Used to print a line of output on the console

- **Two ways to use** `print`:
  - `print("...text...")`
    *Prints the given message as output.*
  - `print()`
    *Prints a blank line of output.*
Strings and escape sequences
Strings

• **string**: A sequence of characters
  • Starts and ends with a " quote " character or a ' quote ' character.
    • The quotes do not appear in the output when printed
  • Examples:
    "hello"
    "This is a string. It's very long!"
    'Here is "another" with quotes in'

• **Syntax Rules:**
  • Strings surrounded by " " or ' ' may not span multiple lines
    "This is not a legal String."
  • Strings surrounded by " " may not contain a " character.
    "This is not a "legal" String either."
  • Strings surrounded by ' ' may not contain a ' character.
    'This is not a 'legal' String either."
  • Strings surrounded by 3 " may span lines.
    """I can span multiple lines
    because I'm surrounded by 3 double quotes""""
Problem: What if you want to have both double and single quotes in the output?

• Consider printing the following output:
  
  She said, “Who’s there?”

• The syntax rules tell us the following is not correct:
  
  print("She said, "Who’s there?")

  We need a new convention to express this, i.e., more syntax and semantics.
Escape sequences

- **escape sequence**: A sequence of characters used to represent certain special characters in a string.

  - \t  tab character
  - \n  new line character
  - \"  quotation mark character
  - \"  backslash character

- **Example**:
  ```python
  print("\t\n\tt how\tare "you"?\\")
  ```

- **Output**:
  ```python
  \t\n  hello
  how  are "you"?\\
  ```
Questions

• What is the output of the following `print` statements?

```python
print("She said, \"Who’s there?\"\")
print("\\\"")
print("\"")
print("\"")
print("C:\nin\the directory")
```

• Write a `print` statement to produce this output:

```
/ \ // \ \ /// \ \
```
Answers

- **Output of each** `print` **statement:**

  "She said, Who's there?"
  `\ \`
  `'
  """
  C:
in he directory

- **`print` statement to produce the line of output:**

  `print("/ \ \ // \ \ \ \ // \ \ \ \ \"")`
Questions

• What print statements will generate this output?

This quote is from
Irish poet Oscar Wilde:

"Music makes one feel so romantic
at least it always gets on one's nerves -
which is the same thing nowadays."

• What print statements will generate this output?

A "quoted" String is
'much' better if you learn
the rules of "escape sequences."

Also, '"' represents an empty String.
Don't forget: use "\" instead of "!
'"' is not the same as '"
Answers

• **print statements to generate the output:**

  ```python
  print("This quote is from")
  print("Irish poet Oscar Wilde:" )
  print()
  print("\"Music makes one feel so romantic")
  print("- at least it always gets on one's nerves -")
  print("which is the same thing nowadays.\"\")
  ```

• **print statements to generate the output:**

  ```python
  print("A \"quoted\" String is")
  print("'much' better if you learn")
  print("the rules of \"escape sequences.\"")
  print()
  print("Also, \"\" represents an empty String.")
  print("Don't forget: use \\
  instead of \" !")
  print("'\' is not the same as \"")
  ```