§2.2, 2.5, 2.11: The Anatomy of an Infant Program

devo

- *Quiz ch1 pushed to next Monday*

14 Sep 2007
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What's on for today (§2.2, 2.5, 2.11)

- Anatomy of a lab write-up
- Components of a baby Python program
- Modules
- Library tools
- Literals, identifiers and reserved words
- Strings, quoting, newlines

Pseudocode

- Pseudocode is sketching out your design
  - General enough to not get tied up in details
  - Specific enough to translate into code
- Use the five control abstractions
- Usually several iterations of pseudocode, getting less abstract and closer to real code
- Don't worry about syntax; worry about semantics
  - Repetition can be done with WHILE ... DO ... or LOOP ... UNTIL ....:
  - Similar semantics; different syntax

Example: add 1..20

- Try again:
  - Initialize sum to 0
  - Initialize counter to 1
  - Repeat:
    - Add counter to sum
    - Add one to counter
  - Until counter = 21
- Alternate version:
  - Initialize sum to 0
  - Initialize counter to 1
  - While counter <21, repeat:
    - Add counter to sum
    - Add one to counter
- Same semantics, different syntax
- Top-of-loop test vs. bottom-of-loop test

Pseudocode: you try (group effort!)

- Problem: print the largest of a sequence of numbers
  - Get sequence of numbers from user
  - Define a variable: max
  - Initialize max to first number of list
  - Loop:
    - If (the current number from the list > max):
      - Set max to the current number
    - Until we hit end of list
  - Print max

Writeups for Labs 1-2 *(L1 due next wk)*

- Full writeups required starting with Lab3
- Labs1-2 can have short writeup:
  - Design (10 marks)
    - Name, student#, CMPT14x, lab section, Lab#1, date
    - Statement of the problem
    - Discussion of solution strategy
  - Code (30 marks)
    - Name, etc. again in code header
    - Well-commented code, formatted and indented
  - Output (10 marks)
    - A couple runs with different input

Components of “helloworld.py”

```
"""A baby Python program.

Name: John Doe
This is a sample program.
"""

import math

print "Hello World!"
print "Pi =", math.pi
```

Module docstring

Import library modules

Program statements

Modules

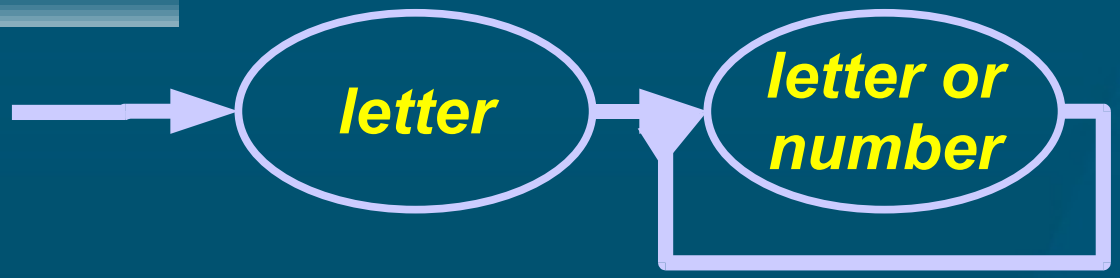
- A module is a container holding
  - items and information
    - Variables, functions, etc.
  - constituting all or part of an executable program
- helloworld.py is a module that is a complete executable program
- math is a library module from which we imported the pi constant
- math.pi is not a module but a name within a module

Identifiers

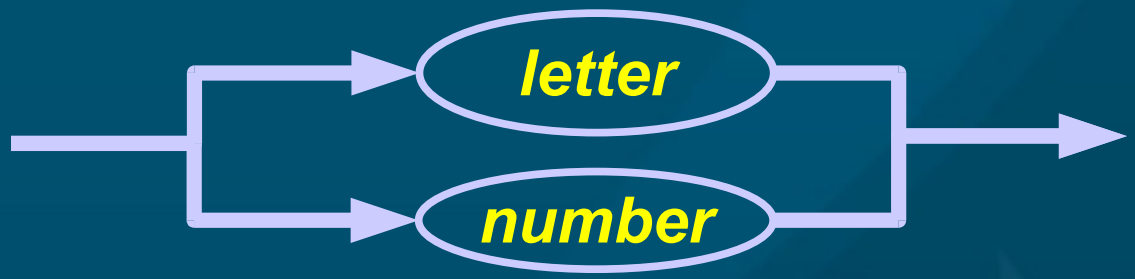
- Identifiers are names for stuff: e.g.,
  - Libraries (“math”)
  - Functions (“print”)
  - Variables (“numApples”)
- Identifiers are sequences of
  - non-blank letters or digits
  - Must start with a letter *(underscore _ counts as a letter)*
- OK: Great_Googly_Moogly, x, My21stBirthday
- Not OK: “hi ya”, h@Xz0r, 21stBirthday
- Case sensitive! Print ≠ print
- These are the rules; we'll talk about style tomorrow

Railroad diagram for identifiers

- identifier =



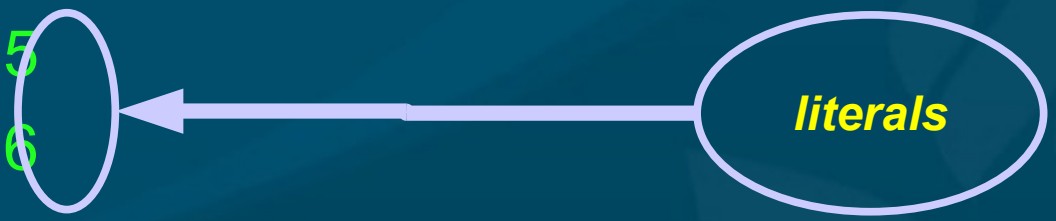
- letter or number =



- number = {0, 1, 2, 3, 4, 5, 6, 7, 8, 9}
- letter = {a, b, ..., z, A, B, ..., Z, _}

Literals vs. identifiers

- A literal is an entity whose name is an encoding of its value:
  - 187.3
  - “Hello World!”
  - True
- In contrast, the value of a variable may change even though its name stays the same:
  - numApples = 5
  - numApples = 6



Reserved words

- You can name your modules, functions, and variables almost anything you want, except
- Reserved words (keywords): special words or markers used to outline the structure of a program
  - import, if, else, while, for, def, ...
  - Complete list at http://docs.python.org/ref/keywords.html

Importing library functions

- Library functions are building blocks:
  - Tools that others wrote that you can use
- Functions are grouped into libraries:
  - If you want to use a pre-written function, you need to specify which library to import it from

```
import math
math.sqrt( 2 )        >>>1.4142135623730951
math.pow( 3, 5 )      >>>243.0
math.pi               >>>3.1415926535897931
```

Python Standard Library

- Library functions provided with every standard Python implementation
- You still have to import them, though
- Our HelloWorld.py program used pi from the math standard library

- There are oodles of standard library functions: http://docs.python.org/lib/lib.html

Strings and quoting

- Strings in Python can be in either 'single' or “double” quotes
- What if you want a quote mark in your string?
  - “It is I; don't be afraid”
  - 'Jesus said, “I am the way, and the truth, and the life.” '
- To include a newline (carriage return) in string, use three double-quotes:
  - ```
    """ This is a multi-line string.
    Even the newline is part of the string."""
    ```
  - This is rather special to Python; in M2 newlines just aren't allowed in strings
    ```

Splitting up strings: print

- print “Therefore go and”
  print “make disciples”
  - Therefore go and
    make disciples
- print “Therefore go and”,
  print “make disciples”
  - Therefore go and make disciples

Note trailing comma

Variables: names and values

- A Python variable is a name for a memory location, the contents of which can be changed by a program.
  - numApples
- The assignment operator = is the means by which the name on the left is given the value on the right.
  - numApples = numApples + 1

Review of today (§2.2, 2.5, 2.11)

- Anatomy of a lab write-up
- Components of a baby Python program
- Modules
- Library tools (what are some we know already?)
- Literals, identifiers and reserved words (examples?)
- Strings, quoting, newlines

TODO items

- Reading: through §2.5 for Mon
- Quiz ch2 next Mon
- Lab 01 due next Wed (myCourses)