Objectives

- Review Lab
- Introduction to
  - problem solving
  - programming languages
  - writing python programs

Review: Lab

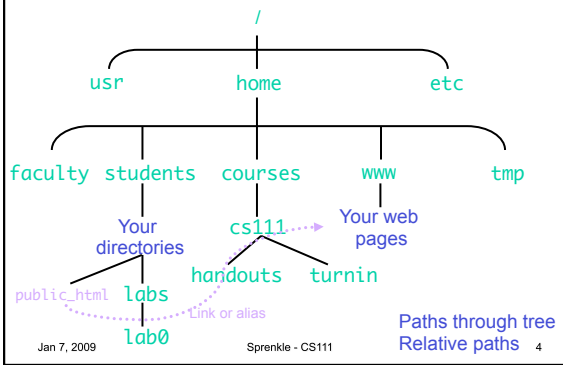
- Learned some UNIX commands
- Created a Web page
- Started writing Python programs

- Lessons learned:
  - Problems are fixable, find a good solution

Review: Linux

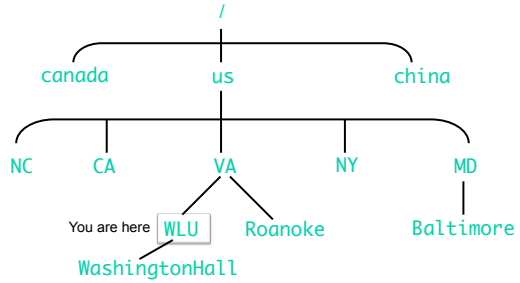
- How do you …
  - Learn more about a Linux command?
  - List the files in a directory?
  - Change your current directory?
  - Make a directory?
  - Find out the current directory?
- What is the shortcut for …
  - The current directory?
  - The parent directory?

Review: Linux File Structure



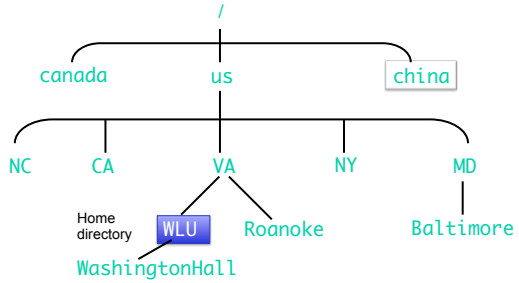
Paths through tree
Relative paths

Relative Paths vs Absolute Paths



- Given that you're at WLU, how would you get to Washington Hall? To Roanoke? To Baltimore?

Relative Paths vs Absolute Paths



- Given that you're in China, how would you go to Canada? WLU? Washington Hall?

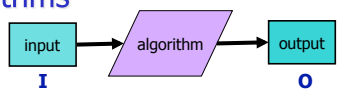
Computational Problem Solving 101

- Computational Problem
  - A problem that can be solved by logic
- To solve the problem:
  - Create a **model** of the problem
  - Design an **algorithm** for solving the problem using the model
  - Write a **program** that *implements* the algorithm

Computational Problem Solving 101

- Algorithm: a well-defined recipe for solving a problem
  - Has a finite number of steps
  - Completes in a finite amount of time
- Program
  - An algorithm written in a **programming language**
  - Also called code
- Application
  - Large programs, solving many problems

More on Algorithms



- Algorithms often have a defined **input** and **output**
- Correct algorithms give the intended output for a set of input
- Example: Multiply by 10
  - I/O for a correct algorithm:

Input	Output
5	50
.32	3.2
x	10x

- More examples: averaging numbers, recipes

Making a Peanut Butter & Jelly Sandwich

- How do you make a peanut butter and jelly sandwich?
- Write down the steps so that someone else can follow your instructions
  - Make no assumptions about the person's knowledge of PB&J sandwiches
  - The person has the following materials:
    - Loaf of bread, Jar of PB, Jelly, 2 Knives, paper plates, napkins

Discussion of PB&J

- The computer: a blessing and a curse
  - Recognize and meet the challenge!
- Be unambiguous, descriptive
  - Must be clear for the computer to understand
  - "Do what I **meant**! Not what I said!"
    - Motivates programming languages
- Creating/Implementing an algorithm
  - Break down pieces
  - Try it out
  - Revise

Discussion of PB&J

- Be prepared for special cases
- Aren't necessarily spares in real life
  - Need to write correct algorithms!
- Reusing similar techniques
  - Do the same thing with a little twist
- Looping
  - For repeating the same action

Parts of an Algorithm

- Input, Output
- Primitive operations
  - What data you have, what you can do to the data
- Naming
  - Identify things we're using
- Sequence of operations
- Conditionals
  - Handle special cases
- Repetition/Loops
- Subroutines
  - Call, reuse similar techniques

An overview for the semester!

Other Lessons To Remember

- A cowboy's wisdom: Good judgment comes from experience
  - How can you get experience?
  - Bad judgment works every time
- Program errors can have **bad** effects
  - Prevent the bad effects--especially before you turn in your assignment!

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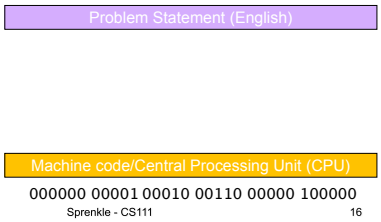
Why Do We Need Programming Languages?

- Computers can't understand English
  - Too ambiguous
- Humans can't easily write machine code



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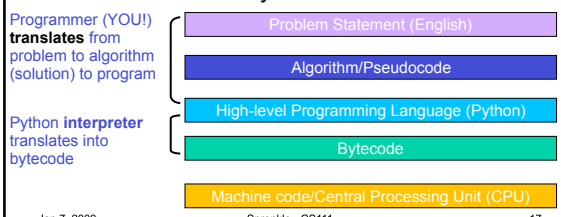

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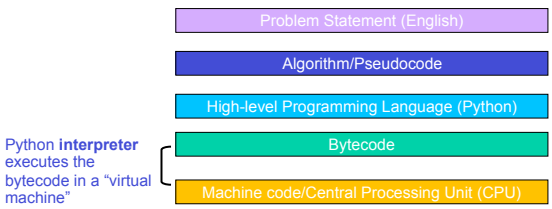
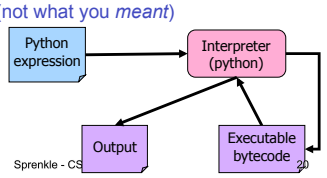


Programming Languages

- Programming language:
  - Specific rules for what is and isn't allowed
  - Must be exact
  - Computer carries out commands as they are given
- **Syntax**: the symbols given
- **Semantics**: what it means
- Example: III * IV = 3 x 4 = 12
- Programming languages are unambiguous

Python Interpreter

1. Validates Python programming language expression(s)
   - Enforces Python **syntax**
   - Reports **syntax** errors
2. Executes expression(s)
   - Runtime errors (e.g., divide by 0)
   - **Semantic** errors (not what you *meant*)



Parts of an Algorithm

➔ Input, **Output**

- Primitive operations
  - What data you have, what you can do to the data
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- Sequence of operations
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Printing Output

- **`print`** is a special command
  - Displays the result of expression(s) to the terminal
- `print "Hello, class"` (string literal)

`print` automatically adds a '\n' (carriage return) after it's printed

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- `print "Your answer is", 4*4`
  - Displays same as:
    - `print "Your answer is",`
    - `print 4*4`

Syntax: commas
Semantics: print multiple "things" in one line

Extra Credit Opportunity

- 10 points applied to Lab grade
- Attend a CS talk, all in Parmly 405
  - Mon, Jan 12, D period
    - Andrea Tartaro: "Authorable Virtual Peers: Using Computer Science to Understand and Support Children with Special Needs"
  - Thurs, Jan 15, 3:30 p.m.
    - Mark Liffiton, "Satisfying Constraints, and What To Do When You Can't"
  - Fri, Jan 23, 4 p.m.
    - Joshua Stough, "Appearance Models for Medical Image Segmentation"
- Post summary on Sakai, following CS Issues write up

Next Time

- More programming fundamentals
- Broader Issue: Technology Education
  - Post write up on Sakai, as response to appropriate topic
  - Your write up will include
    - How interesting you found this article on a scale of 0 to 9
    - Summary of the 3 most important points
    - Article's effect on your understanding of CS
    - Article's relation to our course specifically (if applicable)
    - Question for class discussion
  - See Course's CS Issues page for more information